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CONTENTS.

Original Communications.

SOME HINTS ON THE PREPARATION AND MOUNTING OF MICROSCOPIC OBJECTS.

BY W. H. WALMSLEY.

THIRD PAPER.

IT is a matter of regret, I think, to those who have taken the trouble to think at all about the matter, that in our microscopic work, the efforts of almost all observers and workers are mainly devoted to such preparations as require, at least, moderately high powers and carefully arranged transmitted light for proper showing. Doubtless this is the only method by which we can hope to obtain any knowledge of the real structures of tissues, animal or vegetable, or of inorganic substances, such as rocks; but there are thousands of objects in the limitless realms of nature which will afford instruction and delight to the more indifferent of observers, who view merely

their exteriors with a low power. Many of those require neither preparation nor mounting, being too common or abundant to repay the slightest labor bestowed upon them. Others, however—and their same is legion—can and should be preserved in some permanent manner, readily accessible, and easily arranged for examination. In the vegetable kingdom we are presented with an endless and charming variety of beautiful forms in the seeds of even our commonest flowers, or even weeds, whilst the feathers, scales and hairs of the animal afford a never ending storehouse of treasures for the seeker after the curious and beautiful. The pollen from the tinniest flower, or the sands from the shores of the mighty ocean, alike present us forms and colors of surpassing beauty; and the preservation of these in a permanent form is at times most desirable. It shall be the purport of the present paper to point out some plain methods of doing so, which will produce good results if carefully followed.

Let us term this method of mounting "The Dry Way," to distinguish it from those preparations made in aqueous or other fluids, and proceed to make our mount in one of the several ways whereby it may be done. The books have been filled with such for years, good, bad, and indifferent. We have had full discussions of the merits and demerits of cells, possible and impossible; some made of shellac, turned upon a whirling table with the point of a pen-knife, at an immense expenditure of time and patience; others of wax, bone, tin, hard and soft rubber, curtain rings, and a host of other substances; anything, in fact, but those, or rather that possessing the one quality needful for a dry cell, namely, the quality of remaining dry. For be it distinctly understood, that though a cell may be made and hermetically sealed, in which no appearance of moisture will ever occur, such an event is an anomaly and can never be duplicated with any certainty. No matter how dry the specimen may appear to be, nor the atmosphere of the room or the surface of the covering glass, sooner or later the under side of latter will become covered by a mist like substance, which obscures and spoils the view of the imprisoned specimen. This of course is the case only with such preparations, as are mounted on the bottom of a cell of any depth, the cover being used merely as a protection from dust and other injury. Where diatoms, the scales of insects, or other minute objects are mounted directly upon the under surface of the cover itself, this

cloudy or watery appearance is either never observed at all, or else in so slight a degree as to cause no annoyances. When it does occur in a cell such as is usually used, and for the preparation of which the books give us so many elaborate directions, the only remedy is to remove it, (broken of course,) and replace with a fresh one; the latter in due time being predoomed to share a like fate.

"Is there no remedy for this," you will ask, and I answer unhesitatingly yes, if you will sacrifice your artistic cells of wax or what not, with their pretty colored rings of varnish, and be content with those of humbler or far more useful qualities. Paper, from which such dissimilar articles are now manufactured, as love letters and car wheels, is our friend in need in this emergency. Not sized or glazed or calendered, but soft, porous paper of various thicknesses, to suit our needs; a thick blotting pad being exceedingly useful, for cells containing objects sufficiently thick to require such a depth. If a still deeper cell than this be needed, then a slip of wood, 3x1 inches, and the thickness of an ordinary glass slide, with a hole bored through the middle is most useful; and here again comes in our friendly paper to form the bottom, all of which will be dwelt upon in due course.

The requisites then, for our dry mounting in the manner to be described, are as follows: Crown glass slips of the usual dimensions, 3x1 and of moderate thickness, with cut edges, (grooved or smoothed ones are a needless expense), wooden slips of the same dimensions, with holes through their centres, $\frac{5}{8}$ to $\frac{3}{4}$ of an inch in diameter; covers of medium thickness, circles or squares as you prefer,—the latter being cheaper and equally good as the former; a supply of porous paper of various thicknesses from that of thick writing to a blotting board, two punches 5/8 and 3/4 inches in diameter, some thin card board, covered with dead black paper, to form the bottom of the cells when the wooden slips are used, and a supply of colored paper for the backs and edges of the slides, with the bronzed or figured ones for the fronts of same. These latter may be purchased of any optician at a small outlay and are made purposely, in very neat and pretty patterns. Labels, of course, oval or round, as one fancies, and the tools and materials we have gathered together in our balsam mountings will suffice to give us a very pretty outfit wherewith to commence work on our dry mounts.

What shall we commence with? Here are some lovely little seeds, it may be of the portulaca, or the common chickenseed. Finding their diameter to be a little less than the thickness of our blotting pad, we will determine to make our cell of the latter, and so proceed to stamp a hole in a portion thereof with our ⅝ in. punch, after which we cut out a square of ⅞ in., leaving the hole in the center. Before attaching this cell to the glass slip a dead black bottom must be make for it, and this is best done by pasting a strip of the thin black paper upon the slide. And here let me say that the best and most satisfactory paste for this and all subsequent processes I have ever used is madè with ordinary wheat starch, boiled, and beaten to the consistency of thick cream. It adheres tenaciously to glass, wood or paper and seems to have no tendency whatever to absorb moisture from the surrounding atmosphere.

The black paper having been pasted upon the slide, the cell is in its turn to be pasted upon the paper so that its centre shall be percisely in the center of the slide, when a weight should be placed upon it until dry, and finally attached. The seeds may be attached to the bottom of the cell by means of shellac cement, or liquid glue. Still better and in every way satisfactory is a cement made by dissolving a small quantity of shred gelatine in cold water, gently heating it after being dissolved. This should be made in small quantities as wanted, since it will not keep. It is tough and very tenacious, and does not dry too quickly, excellent qualities in a cement for such purposes. Use only a sufficient quantity to attach the specimen firmly; any superfluity makes an unsightly blotch in the mount. The cleansed glass cover is now to be cemented on, with the same paste, when we are ready for the finishing.

The best colors for the covering papers are a bright canary for the back, and a red with gold bronze figures for the front, and these are the kind usually found on sale at the opticians.* The back should be pasted on the under side of the glass slip and turn up over the sides and ends on to the upper side of the same, over which it should extend for an eighth of an inch all around. Then the red and gold front with a ⅝ in. hole previously punched in its centre is to be pasted smoothly over the whole, equi-distant from the edges all around. The labels,—usually plain white

* The writer regrets that the illustrations intended for this article have not been finished by the engraver in season to appear with the letter press.

ovals,—are to be placed upon each end, when the appearance of the whole mount will be extremely neat and handsome, and the maker's mind need bear no troubles as to its future. Should any appearance of moisture under the cover be seen (which is not at all likely), a slight warming over the lamp will dispel the same, and leave all in pristine brightness.

Should our specimen be too bulky or thick to be contained within the shallow depths of a cell made of the thinnest blotting pad, we must have recourse to the wooden slips, which will be found to form a cell deep enough for any mounting one may ever desire to make. The method of so doing is precisely the same as that followed with the glass slip, excepting that we must paste a strip of cardboard, covered with the dead black paper, to the under side of the slip to form the bottom of the cell. The slide is to be covered with the papers, and labeled exactly the same as though it were of glass.

Should the black paper not be readily procurable, a very excellent dead black for the bottom of the cell may be made with common lampblack water color, which dries with a dead surface very agreeable and pleasant for mounting foraminifera and similar objects upon. If a little gum arabic be mixed with the water, and the specimen placed upon the surface of the paint whilst still moist, it will be found that the latter will form an excellent cement, as well as background for holding the preparation.

Illumination by means of a lieberkuhn, which throws the light directly down upon the object without shadows, has been too much neglected. In England it is a very ordinary method of viewing the opaque objects, and a lieberkuhn is usually furnished with every object-glass from a three inch to a four-tenths. But it is different here, and I am quite sure that the great majority of our observers, professional and amateur, are totally unacquainted with its use. I think this is to be regretted, since they lose much, both in pleasure and instruction from its non-employment. Hoping that its use may become more general, I will give a hint or two as to the method of mounting a preparation, to be examined by this form of illumination.

The lieberkuhn is a concave speculum fitting over the mounting of the objective so that the front lens of the latter project through the middle of the lieberkuhn. Parallel rays of light are thrown up-

wards from the surface of the plane mirror, which being received upon the concave face of the lieberkuhn, are in turn reflected downwards upon the object under view. The foci of the objective and lieberkuhn being coincident, it follows that when the specimen under view is brought precisely into that of the former, its illumination by the latter is at the best. The central rays of light, however, coming immediately beneath the object, must be stopped out by some opaque background to insure the best effect. There are many modes of effecting this, and most of them involve the use of the various cells, which are hermetically sealed. There having been described at length by many more capable writers, I shall confine myself to the one method whereby our porous paper medium may be employed. For this purpose we shall need no additional tools or materials, save a large punch, say ⅞ inch, and some small circles of thin glass of ¼ to ⅜ inch in diameter. Placing a glass slip upon the two tubes, we proceed to paint a disc, (very slightly larger than the circle of glass to be used), exactly in its centre. This is to be done with asphalte or Brunswick black, and the slide set aside for the same to harden, which it will do in an hour or two, or, if necessary, may be hastened by heating gently over the lamp or on the brass table. A second coating of the asphalte is now to be applied, and a circle of thin glass slightly warm is to be placed upon its surface with the forceps and gently pressed down to exclude air and cause perfect adhesion over its entire under surface. We have now a perfectly opaque stop, with a clean glass surface, into which the most delicate object cannot sink and be lost, as is always the case if mounted directly upon the surface of asphalte, without the intersection of the thin glass. Bear this carefully in mind, and always use the glass circle if you wish to insure your preparation against disappearences in a black sea of death with the first hot spell.

The subsequent proceedings are almost the same as those first described in the present paper. The cell is to be made with the large punch, so as to leave ample space for the rays of light from the mirror to pass between its inside edges and the central stop, upon which the specimen is to be mounted. If one thickness of the paper or blotting paper be not sufficient, a second or third may be pasted upon it, until the desired depth is reached. And, of course, the covering paper for the back must be punched to allow

the light to pass up, and not be put on solid, as mounts for ordinary illuminations are. The object is best attached to the glass circle by means of the gelatine cement, and the slide is to be finished precisely the same as heretofore directed. And finally, all fears of moisture spoiling a beautiful preparation in the future may be dismissed as groundless.

Our work thus far has been confined to opaque objects requiring surface illumination, and it may be said that the great majority of all to be mounted in the dry way are of this class. But many, notably scales and hairs of insects, and plants, many diatoms, sections of pith, etc., are best viewed in the dry state and by transmitted light. Most of these may be mounted upon the cover, (the method of doing so in the case of diatoms, having been directed in a former paper), and thus may be mounted in an ordinary cement cell without fear of moisture. The most satisfactory cement for this purpose (and most others), in my experience, is the white zinc, when properly prepared. It dries quickly, has no tendency to run in, and makes a beautiful finish to a mount. It should be used as follows, and the same directions will apply to asphalt or Brunswick black, if those cements be preferred:

Let us suppose that a 5/8 inch cover is to be used. Placing our glass slip upon the turntable, we proceed to run a ring of cement about its centre, the outer diameter of which shall be slightly in excess of 5/8 inch, the width of the ring being about 1/3 of an inch. This first coat must be allowed to harden thoroughly, as on this depends all future success of the mount. If the slightest softness is left, it will be sure to yield still further in hot weather, and by capillary attraction run in and spoil the slide. To insure against all possibility of failure, let the slide be set aside for at least 48 hours, or else be baked in an oven. When the cover is ready to be place upon it, a fresh ring of the cement is to be run upon the top of the first, extreme care being taken not to let the fresh extend to the inner edge of the old cement, lest it run in by contact between the surfaces of slide and cover. The latter is then to be placed upon the ring center with the forceps, and slightly pressed down. A very thin coating of the cement is now to be applied around the edge, and allowed to harden, after which as many may be applied, with or without colored rings, as the taste of the worker may dictate.

I find that the limit of my paper is reached without having exhausted the subject of which it treats, and the further consideration thereof must be left to a future one. In my next paper, therefore, I shall hope to finish this, and, at least, make a commencement on mounting in fluids, a subject that I regard as far more important than either balsam or dry mounts, and one in which practical hints, the result of many years of experience, may prove of more value to the beginner than anything I may have heretofore offered.

It may not be amiss to say, in concluding the present paper, that I have lately, after a long series of experiments, succeeded in perfecting an attachment, applicable to any microscope, whereby negative enlargements of all objects not requiring a greater power than ¼ of an inch, may be readily and perfectly made by any one, even totally unacquainted with photography, and from these positions printed for throwing upon the screen with a lantern; at an infinitesimal cost of money and time. The whole process is performed by the simple aid of an ordinary coal oil lamp, neither Heliostat or any other costly form of illumination being required. I shall hope to describe and illustrate this apparatus in an early number of this magazine.

SOMETHING ABOUT OBJECTIVES.

BY PROF. ALLEN Y. MOORE, M. D., PROFESSOR OF MICROSCOPY IN CLEVELAND MEDICAL COLLEGE.

THE objective is regarded as the most important part of the microscope, and deservedly so, for upon its correct performance, depends the real value of the instrument.

The lower power objective and those in which the angular aperture is less than 75°, are generally provided with no adjustment for correcting the aberrations produced by the varying thickness of cover-glasses, but when the aperture exceeds 90° or 100°, some correction is needed, in order to make the objective perform equally well over various covers.

This adjustment is made in various ways, according to the quality or maker of the objective. In most of the best objectives it is produced by a rectilinear approximation of the lenses; the inner systems moving back and forth, while the front lens remains stationary. In some other first-class (and especially English) ob-

jectives, the front lens moves and the inner systems are fixed. In either case the movement is produced by a milled collar around the body of the objective. This collar is generally graduated so that its position can be recorded for future reference. In a cheaper grade of objectives the adjustment is made by a screw-movement of the outer tube. This rotates the front lens, and unless well made it is apt to be decentered. However, if well made, it forms a very efficient and cheap adjustment.

While it is true that this adjustment corrects the aberrations produced by the cover-glass, it also compensates for the difference in length of the bodies of different microscope stands, and the different fluids used for immersion with objectives intended for that mode of use.

This matter of collar correction does not seem to receive the attention which it deserves, and among the younger microscopists it seems to be overlooked entirely. As so little has been written on this subject, I will give a few simple directions.

Every objective has a certain color with which it shows best, and there is probably no object better adapted to the purpose of determining this color than a well marked Podura scale. Although this is a most excellent test-object, it has nothing to do with diatoms, and the young microscopist need have no fear of being called a "diatomaniac" from the possession of one. When a good scale is once obtained, great care should be taken to keep it dry, for when wet it is of no use.

Now, by examining this scale with a first-class $\frac{1}{4}$ or higher power of medium or wide aperture it will be seen that the "exclamation marks" are more or less colored. Pay no attention to this at first, but carefully turn the collar back and forth until the marks appear sharpest and smallest. That will be the point of best correction, and now the color of the markings should be noticed. Having carefully determined the exact tint of best correction, throw the objective a little out of proper adjustment by turning the collar towards open point or zero. This over corrects it and at the same time notice the change in color. The markings seem to expand, becoming hazy and not at all sharp. Now, turn the collar towards closed until the point of best correction is passed; here the same thing is seen in regard to expansion and haziness, but a different tint seems to make its appearance. By attending very closely to this color

(which is the secondary spectrum), the proper correction can easily be made. I can best illustrate this by the following trial:

I have before me a $\frac{1}{15}$ objective. By trial over a Podura scale I find that when best adjusted the marks appear of a brilliant ruby red (and most of the finest objectives which I have seen show best with this color); by turning the collar towards zero they turn greenish, while, if turned towards closed, they become pink. Hence at the first trial of any such object, should it appear green the collar should be turned towards closed until the ruby tint appears, and if too pale a red or pink, the collar should be turned towards zero. By a little practice, the microscopist can tell at a glance which way to turn the collar.

There are some objects on which a correction cannot be thus made; in such cases the coma must serve as a guide. The edge of a red blood corpuscle will serve as a good test for practice in this way. By carefully moving the collar back and forth until the edge is sharp and clear, it will be seen that a brisk movement of the fine adjustment causes the edge of the corpuscle to expand, both as it goes beyond the focal point and also within the focal point. If the correction has been made exact this expansion (coma) is equal both ways, but should the greater expansion be when the object is beyond the focal point the objective is under corrected and the collar should be turned towards zero; but should it be the reverse, that is, the greater expansion within the focal point, the objective is over corrected and the collar should be moved towards closed.

Very deceptive appearances are sometimes produced by a want of proper correction. For example: Should an objective be just capable of showing an object (such as a diatom) in dots, when corrected; it will show it in lines if not corrected. If the dots are irregularly arranged, the appearance will be that of a network, instead of lines. This is frequently seen in any granular matter,—such as the nucleus of a red blood-corpuscle of a frog—when in good correction, it is shown as granular but by throwing the objective out of proper correction a net-work is apparently produced. This should be borne well in mind when describing such objectives. The same occurs with very inferior objectives even when in their best correction.

It has been claimed that homogeneous immersion objectives need no adjustment. This is true only when the length of tube and

density of the medium in which the object is mounted is the same as was originally taken into account when the objective was made. Any variation from this will affect the result. If the microscope be provided with a draw-tube, such objectives may be corrected by that, in this way: Pulling out the draw-tube over corrects the objective while pushing it in undercorrects it. Hence, should the object appear too green the draw-tube should be pushed in, while if too pink, it may be drawn out, until the ruby tint is obtained; of course supposing it to be previously ascertained that the objective corrects in those colors.

HUMAN RED BLOOD CORPUSCLES.

BY "GRAY BEARD."

FOLLOWING is a description, with drawings, of what was seen under the microscope in a case of poisoning by so-called whisky, October 3, 1881, at Orange Grove Plantation, Thibodeaux, La. "*Nullius addictus juvave in verba magistri.*"

EDITOR MICROSCOPE:—Yours of the 16th ult. came to hand in due course of mail, and receipt was acknowledged by postal. The case of child poisoned by whisky was one in which I took much greater interest optically than pathologically. Had I been impressed with its importance in the latter light at the time, as fully as I am now, I should be able to prove to others that which, I feel assured, was presented to my own vision; whereas, I now can say but little more than what can be gleaned from the enclosed photograph of drawings made for my own use. I have no mount of the blood, and although there was some of the whisky left (as I have recently ascertained), such was positively denied as being the case at the time. On applying to the dealer, that special grade had all been sold—not only the whisky, but the empty barrel, and furthermore, his bill did not show the grade; in fact, I seemed to be looked upon as a dynamic compound to blow up the whisky men. Now, however, I have satisfied the local dealer that it is the whisky and not the men I'm after, and so may possibly through his merchant in New Orleans be able to obtain a sample of whisky purporting to be the same, in which case I will forward to you.

But to the case. Being detained in Thibodeaux during the day of October 7, 1881, on my return was told that there was a dead

child in the quarters, and I suspected something might be wrong. Found the child "laid out" for burial, but life not extinct. Sent immediately for my family physician, who did not get out to the plantation till three hours after (10 P. M.), when the child was dead. She drank the whisky about 7 A. M. Before leaving the child, I directed friction, fresh air and warmth to body. Bound a string around little finger of left hand, and got blood by puncturing about one-quarter of an inch below the nail, and immediately put it under the microscope on reaching my room, about four acres distant. Part of the blood I let dry, the other I kept moist by water, but seeing that both specimens acted alike after three-quarters of an hour, I let it all dry. I used no cover glass for the first. Thought only to take a casual look, and then be done with it; but second, finding unusual changes going on, I was fearful of altering these changes mechanically. After about three hours all changes ceased. At first I used a glycerine front, dry one-fourth B. and L. (one with which I've had good views of number 16 Möller dry plate) with B and one-half inch solid eye-pieces. As the corpuscles came in focus somewhat like fig. 1, (not concentric waves to circumference, however,) I laughingly said to myself, "none of your tricks Mr. Illumination, (Note, I sometimes talk to myself when at such work) I'll have none of your faulty rings" but a second glance showed me these rings were not tricks of Mr. Illumination, and right here the optical interest got up to high pressure. I cross questioned my $\frac{1}{4}$ with a dry adj. $\frac{1}{8}$ of 115° a lens of good definition, also with a $\frac{1}{16}$ dry non adj. Beck's 120° all of which gave support and confirmation to the language of the $\frac{1}{4}$. With the $\frac{1}{8}$ carefully adjusted, eye-piece and tube arranged for approximating from x 1000 to x 1500, I watched the interior contractings until they ceased. My family physician, arriving before I put up work, took a look, remarking it was a sight he had never seen or read of. The color of normal red corpuscles under correct manipulation I consider to be as you describe in your manual with the addition of a breath of blue and violet playing over them, but in this case they were a reddish brown.

The waves or bands were concentric to the external mass which varied greatly in different corpuscles. I saw 4 and 5 gradually contract internally to 7 and 8 leaving b. (between a. and c.) of diagram 15 transparent, the contracted b. becoming denser

(apparently) in some cases so much so as not to be able to differentiate it from c. In no case did c. seem to contract as much in proportion as b. although (not measuring) I thought they did some; but was not this merely a change of form without change of density, for a. in fig. 12 became thicker altering the outer form at c. fig. 12. Many of the changes I saw going on when the focus and light were constant. Again by extremely careful manipulation I am convinced that in corpuscles 11 and 12 I saw double contour to an investing membrane or sac. Figs. 11 and 12 I drew three times the diameter seen in hopes to approach the appearance under the microscope in this double contour but have made a failure; in all other respects the drawings of corpuscles 4, (7 contracted state of 4) 5, (8 contracted state of 5) 6, 9, 10, 11 and 12 give a good representation of how they appeared to "Gray Beard," an appearance totally different in their indications from what I have been taught to believe respecting the structure of the red corpuscle of human blood. Figs. 4, 5, 6, 9, 10, 11 and 12 were the most marked of any of the corpuscles I saw. There were many others giving an intimation of the same appearance, yet there was not even one crenated corpuscle seen, and very few that were even distorted from circular (outer) conformation. There was only one other seen in position of Fig. 12. Could not find even one white corpuscle, although I searched for them. Am not pathologist enough even to think what it may mean! What does it mean in this instance?

The mass of the corpuscles impressed me as having less of the bi-concavity than normal. Can it be that this lessening of the concavity and change of color (from normal) are in any way associated. I'm inclined to think so, but it leads me into a chemical field not only beyond my experimentation, but beyond my pen.

Corpuscle, Fig. 12, I did not find till after internal contraction had ceased, when it presented a sight which would have astonished any microscopist of the age—a clear view through a corpuscle edgeways showing outer sac of double contour, nucleus, contracted mass around nucleus, leaving a perfectly transparent space between it and the outer sac. I was not in search of light to support any theory, but merely looking to see what I could see, and saw only that which was in direct opposition to what I had been taught, believed, and found endorsed by the mass of my readings on the sub-

ject. I may be "optically deluded," yet whether so or not I think there is something in this description of the case worthy the consideration of the pathological scientist. May it not point in a direction to find a key for the differentiation of the red corpuscle thus far unknown. It suggests to me that said key may be in the chemicals used in coloring, flavoring and even manufacturing certain so-called whiskies, but then the question arises, will they produce the same results in corpuscles treated after taken from the human body? In this case they had supposed the child dead for eight to ten hours; but I stop speculating, simply wishing to describe, leaving speculation and experiments for abler parties. My drawings show figures (and remarks) not called for by your letter, yet prefer to send it just as it was prepared for my own use among my non-professional friends (like myself) and some few medics who really know less of blood and some other thing under the microscope than unprofessional "Gray Beard." Figs. 1, 2, and 3 are my ideas as to correct results in manipulation, when viewing corpuscles. This may aid you in forming an idea of how far to trust my sight, or how much to place to the account of "optically deluded." I have frequently been unable to get fine results from lenses which bear the name of first-class, (among which I'm sorry to class a ⅛ hom. 1-32 numerical ap), and was just beginning to think that untaught homespun manipulation would never be able to master a modern wide angle objective, but a 1-10 by Tolles, with hom. im. fluid has taught me that even homespun manipulation can do something with some lenses, for this 1-10 is one of the most easily managed of any I've handled. No trouble whatever to bring bal. am. pel. out equal to photograph made under Tolles direction, giving its best results. This, too, by either day or lamp light. Recently having a spare day in New Orleans, spent it beween Dr. Schmidt, of Charity Hospital, Dr. Smythe, and Dr. G. Denson. Long before appearance of Dr. B.'s paper I was very decided in my opinion that high grade lenses, even if hom. should be adjustable and while with Dr. Denson, for the first time, had a chance to settle the matter practically to my own mind by comparing with another. Whether using Zeiss' ⅛ adj. water im. Tolles $\frac{1}{10}$ hom. or other lenses for best results, invariably I had to adjust from 1½ to 3 points, nearer closed, than Dr. D. Had my ⅛ been adjustable, I think it would have given me good results, for it bore

some evidences of what I consider a fair lens. Have just received the October, 1881, number of Phin's journal. Hope he will not take another Rip Van Winkle nap shortly. I miss his journal when it fails to come to hand. Should any questions suggest themselves, they will meet a prompt reply.

I seldom use camera lucida in drawing, unless it be to make measurements. In Fig. 6 there was a faint trace of a line between the double mass. I could not satisfy my mind whether this was a single nucleus with two nucleoli, or two nuclei, each having a nucleolus. The corpuscles 6, 9 and 10 concracted leaving b, diagram 15, transparent. By looking steadily at 4, 5, 6, 9 and 10, you will notice that my drawings give more the impression of convexity than concavity, and is in accordance with the view under the microscope. Fig. 9 may be slightly exaggerated, yet the elevation was very marked in the corpuscle. Figs. 4, 5, 6 and 10 satisfy me as faithful copies of the original corpuscles, and so does 9, except the impression it makes of "coming up" (I know not otherwise how to express it), still I do not mean that peculiar "rising," of which Prof. Smith writes, page 276, "How to See," and which I have often had to fight as an "imp from below," in addition to simple increase of convexity. Nos. 11 and 12 are also satisfactory, excepting the double contour, which I cannot represent faithfully, as seen in the microscope. I have merely hinted at it in the drawing 11, although the better view under the microscope was corpuscle 12.

EXPLANATION OF PLATE.

Fig. 1. Shows what I call concentric waves from faulty manipulation.

Figs. 2. and 3. My idea of correct illumination of red corpuscle is intermediate between Nos. 2 and 3, (almost impossible to represent by a drawing). No. 2 slightly within and No. 3 without the focus.

Figs. 4, 5, 9 and 10. Individual corpuscles seen soon after the blood was taken, showing bands and waves concentric to internal mass not to circumference.

Fig. 6. Either a single mass with two spots, or two masses with a spot in each, seen at expiration of one hour.

Figs. 7 and 8. A view of Nos. 4 and 5 at expiration of three hours during which time contraction was gradually going on within but no change in outer conformation.

Fig. 11. A representation of the more marked corpuscles in this case as it appeared at expiration of four hours when internal contractions had ceased.

Fig. 12. One, of only two, seen edgeways, after contraction had ceased. Notice conformation at c. in reference to internal mass.

Fig. 13. A diagrammatic section of the "Homogeneous mass theory" which has been taught me up to date.

Fig. 14. Diagrammatic section of "Old Cheese theory"—homogeneous mass of increasing density.

Fig. 15. Diagram of what this case has forced me to believe, viz., That the red corpuscle of human blood is a semifluid homogeneous (?) substance b. enclosed in an investing membrane or sac c, and containing a nucleus a, and in some cases (rare) a nucleolus also.

Fig. 16. A cross section of No. 15, like letters referring to like parts.

Fig. 17. Diagram after contraction and differentiation, probably caused in this case by the chemicals in addition to the alcohol, used in coloring and flavoring certain so-called whiskies—b. the mass contracted, leaving d. transparent, revealing a double contour at c.

Fig. 18. Cross section of diagram No. 17.

REMARKS.

The color of the corpuscles before contraction was a reddish-brown and not what I consider normal ; viz., a yellowish-green (delicate tint), with a breath of blue and violet playing over them. After contraction the space between a. and c. was transparent at d. See corpuscle No. 11 in connection with diagrams 15 and 17, as number twelve was the most absorbing view I've ever had with the microscope, and while admitting that I was more especially interested in this case optically, can but think it worthy the consideration of the Pathological Microscopist.

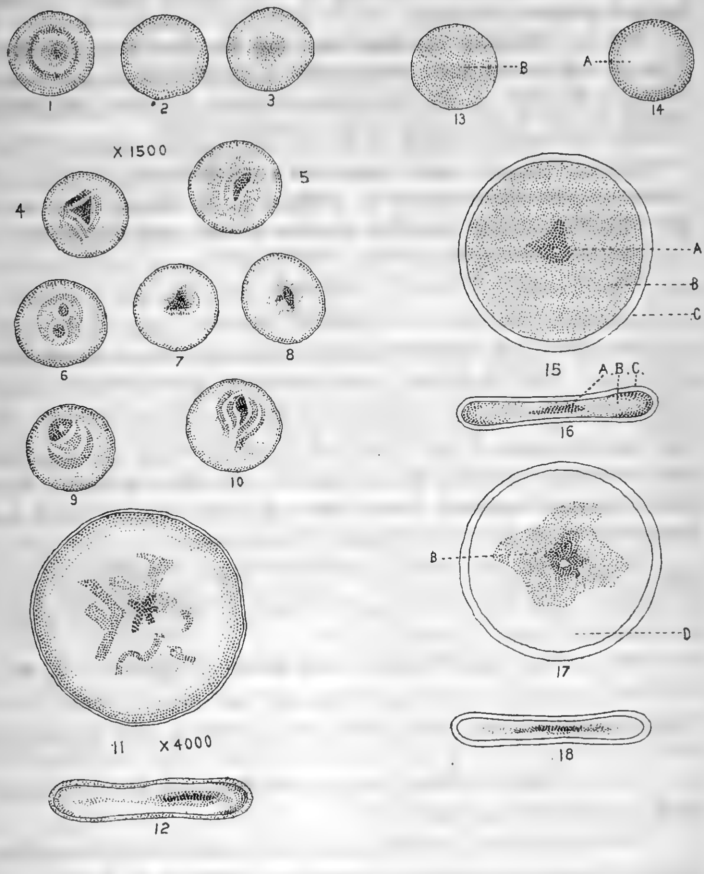
The drawings are faithful representations of that which "Grey Beard" believes he saw October 3, 1881, in case of a child poisoned by whisky; if however he is "optically deluded," whoever will take the scales from his eyes will receive grateful thanks.

From original pencil drawings and notes. G. C. T.

THE MICROSCOPE ON THE DRUGGISTS' COUNTER.

The following drugs were purchased as fair articles. The mace came from a grocery.

In a number of powdered opiums a supposed adulteration was found so closely resembling mustard as possibly to be mistaken for it. The source of this vegetable tissue proved to be an excessive impurity of the gum, differing, however, from the latter's wrapping leaves. Whether these leaves or this impurity came from the poppy plant remains to be seen upon procuring a specimen of papaver. A small amount of starch was seen in one of the two specimens of gum opium, but in none of the powdered.



MICROSCOPIC DIAGRAMMATIC

HUMAN RED BLOOD CORPUSCLES.

[illegible]

Powdered gamboge contained as its only organized impurity, or rather adulteration, a small amount of wheat starch.

"Powdered mace" was so badly treated with turmeric and wheat starch that even none of its simple structure could be discovered to account for its feeble taste and smell. These properties, however, could be supplied by the additions of an essential oil.

Ergot is another drug whose simple structure admits the quick detection of foreign objects. A specimen of the powder contained about three per cent. of starch.

The same remark may be made of powdered orris and lycopodium. The former proved pure, the latter with about two per cent. of bean starch.

The remaining drugs yielded but negative results. Nux vomica, valerian, culumbo and senna were apparently pure. The characterless structure of the last three renders difficult of detection the introduction of many impurities.

In the undissolved residue from powdered aloes of about ½ per cent. a small amount of starch existed. In the same form of powdered extract of licorice there was found no adulterant.

Attention was attracted to the contents of an open box of the proprietary "Kidney Wort," by a strong resemblance in appearance and smell to roasted beans. Cracked roasted beans to the extent of about 90 per cent. it proved to be! Fragments of senna leaves were scattered through, but the second largest ingredient was what was found upon some inquiry to be couch grass, triticum repens. These, with a few fragments of large and small roots were all that could be discovered or identified, and it may be wondered how apparent or real effects could come from their three-minutes' infusion. The fine siftings were examined for active principles without success.

With the microscope on the drug counter results are liable to serious curtailment from lack of time and proper surroundings.

"R."

Bechamp estimated that eight thousand millions of germs of one micro-ferment only occupied one cubic twenty-fifth of an inch. Not one of these minute bodies could develop except by carrying on complicated processes of a chemical nature, involving very active movements of its atoms and molecules.—*Ex.*

Editorial Department.

THE books have been balanced, and Vol. 1, of THE MICROSCOPE has closed. The experience of the past year has been of great value to us and we propose to give our readers the benefit of it by offering to them a much better journal.

The unexpected financial success of the enterprise proves that there was a demand for a practical help of this kind. Therefore we say to all our friends, give us your aid for another year, by getting your friends to subscribe, and by contributing practical articles to our columns.

Let us make THE MICROSCOPE a great help to all in our search after the unseen.

WE had a pleasant call from Mr. Lomb, of Bausch and Lomb, Rochester, N. Y.

We had an evening together "over the tube" and had the pleasure of seeing the 1/8 homogeneous of this firm easily go through number 20 of the Möller p. platte, although we cannot testify to the "152.400 lines to the inch." This objective deserves especial notice, so does their new 1/6 dry.

Among the new accessories of this house especial attention is directed to their homogeneous immersion condenser of very ingenious device, a mechanical finger, an attachment to the turn-table for cutting covers and also a hand-rest for the turn-table.

Mr. Lomb was on quite an extended tour, and he reports great interest in microscopical matters everywhere.

Mrs. Stowell is the richer, by the call, in the possession of a very fine one-half inch achromatic condenser, giving a large field, much light, and sharp definition. The new "Model" microscope of this firm is illustrated in their advertisement.

THE fact that Professor Arnold has consented to offer his services to the public—see our advertising pages—is a very significant one. It marks a strong advance in microscopy, and as Americans, we are glad to see the announcement in our own country.

DR. PELLETAN'S *Journal de Micrographie* comes to us as regular as ever, notwithstanding its threatened annihilation by a myopic contemporary. If we had our way about it, we would insure complete success, not only to every microscopical journal now in existence, but also to, at least, a dozen more.

WE notice an announcement of the sixth season of excursions "from Detroit to the Sea." These excursions are under the charge of W. H. Brearley of the *Evening News*. We wish to notice this excursion especially for two reasons: First, Mr. Brearley is a very earnest worker in microscopy and has done more, we believe, than any man to make the "Griffith Club," of his city, a success. He owns a very complete outfit, even to an oxy-hydrogen lantern with microscopic attachment, objectives, etc. Second, because we formed one of the company last year. With "special" Pullman cars to commence with, a "special" steamer on the St. Lawrence to fill out with, and "special" good times to end with, who can grumble at $20 for the round trip? The Thousand Islands, the Rapids, the Mountains, the Sea, who can ever forget them? An excitement, a series of surprises, a pastime, a rest. For thirty cents Mr. Brearley will send you a guide book telling you all about it.

DO you intend to be present at the Elmira meeting, August 15th? Be sure and come and bring something good to say with you; or if you have no time to write anything, wait until you get in the meeting and out of the fullness of your heart let your mouth speak. Think about the meeting, talk about it, write about it. Make it a success.

WE have just received a slide of Teichmann's Hæmin crystals, for sale by James H. Logan, of Pittsburgh. They are very fine. Mr. Logan offers some standard works for sale also.

HARTNACK'S microscopes have a fixed reputation. The former high price of these instruments has prevented their general introduction. If you will send to G. A. Smith, of Boston, for a circular you will see that this is no longer true.

MR. ZENTMAYER says he is going to issue a new catalogue very soon. So get one and see what this model "worker in brass" will offer you. Have you seen his Army Hospital Stand?

"IN order to perpetuate his great fame,
They called a society after his name."

And so the microscopists of Dansville, Ill., surprised Mr. E. H. Griffith, on the 24th of February, by forming "The Griffith Microscopical Club." If there is anything in a name, we know it will be a busy and successful club.

THE Elmira Microscopical Society give their first annual soiree April 20th. All visitors from abroad will be entertained by the society.

JUST as we go to press we are in receipt of a personal letter from Professor A. Y. Moore, of Cleveland, in which he says he has resolved "the amphipleura pellucida with a $\frac{1}{6}$ homogeneous by central sunlight." Mr. Fasoldt will have to send his 1,000,000 lines to the west if he wants them to be seen.

PIGEON-POST FILMS.—Dr. R. H. Ward, of Troy, N. Y., has a supply of the microphotographic films as used for transmitting news by pigeon-post during the siege of Paris. He is distributing these very interesting curiosities to correspondents, and will send an unmounted piece, suitable for a microscopic specimen, to any microscopist, on request, provided a stamped and directed envelope be sent for reply. Exchanges in return are not asked, but will be accepted with appreciation if sent.

Society Proceedings.

STATE MICROSCOPICAL SOCIETY, OF ILLINOIS.

A MEETING of the State Microscopical Society of Illinois, was held at the Academy of Science, No. 263 Wabash Ave., Friday evening Feb. 10th, 1882.

The president Dr. Lester Curtis occupied the chair. After the usual routine business Mr. E. B. Stuart read a paper entitled: "Notes on the Iodo-Sulphate of Quinia."

The speaker stated that some time ago it became desirable to ascertain if a certain sample of muriate of morphia contained traces of quinia, and on looking up the various methods which might be used in making such a test he found no reference to the influence of morphia on the iodo-sulphate test of therapath. As this test had, for some time been a favorite with him, partly on account of the certainty of the reaction. He first tried the reaction on a solution containing one part of quinia and nine of morphia.

The morphia in this mixture did not prevent the formation of the iodo-sulphate of quinia, nor did it have any effect when the morphia was in the proportion of 1000 to 1 of quinia, and he thought that in this test the morphia was entirely indifferent.

The mode of performing this test, he stated was to dissolve the salt in dilute alcohol by the use of sulphuric acid which is essential to the reaction, and the solution warmed to about 100° F. Very dilute tincture of iodine is then added, drop by drop, with constant agitation. When a sufficient, or equivalent, quantity of iodine has been added the precipitate suddenly appears and quickly subsides.

In a mixture of the four principal cinchona alkaloids, the quinia is first separated, then the cinchonidia, which is followed in turn by the quinidia, and finally by the cinchonia. The latter reaction takes place very slowly, however, and only in tolerably concentrated solutions.

The separation of cinchonidia from quinia by this method is far from complete, and unless present in large proportion, all the cinchonidia is likely to be precipitated along with the quinia. On recrystallizing from alcohol, however, the two salts separate and can be distinguished by the microscope, although not very readily.

After recrystallization the shape of the crystals becomes definite, mostly appearing in their rhombic prisms.

Mr. Wm. Hoskins spoke of the differences between the crystallization of the fat of butter and that of lard, tallow, etc., etc.

The speaker stated that upon melting and then cooling the clarified fats slowly, the differences in the crystallization of the various fats were very marked, and that he was enabled in this way to distinguish positively adulterations of suine, oleomargarine, etc., in butter. After some discussion the meeting was declared informal.

WM. HOSKINS,
Secretary.

THE BUFFALO MICROSCOPIC CLUB.

The regular monthly meeting of the club was held Tuesday evening, March 14. There was an unusually large attendance, particularly of physicians. Dr. Geerge E. Fell read a paper on "The Histology of Aneurismal Clots," which was listened to with great interest. He briefly reviewed the different forms of the disease, which essentially consists of a pulsating tumor, or expansion of an artery. The peculiar structure and formation were described and illustrated by drawings and sections. The method found most successful in examining the abnormal tissues was by the usual process of alcohol hardening, the cutting of sections by a modification of the plan adopted by Dr. Seiler, and the subsequent clearing in carbolic acid, and mounting in Canada balsam. Dr. Fell then detailed the method of differentiating the minute structure by means of various staining fluids, and explained clearly the results of his examination of the structure in question.

The paper was discussed by Drs. Barrett, Ward, Lewis, Stearns, Howe, Smith, and favorably commented upon.

Prof. Kellicott, after reading the report of current literature, detailed some of the practicabilities of cutting of thick plate glass for a "section cutter," using simply a rat-tail file and hot iron for the purpose. The results attained demonstrated that a little skill scientifically applied would do wonders in glass working.

Dr. J. W. Ward gave an interesting account of a new microspectroscope made from a frog's muscle, and capable of fine work.

President Henry Mills reported some personal observations upon the cause of motion in diatoms. Reported from the *Royal Microscopical Journal.*

ELMIRA MICROSCOPICAL SOCIETY.

The regular monthly meeting of the Elmira Microscopical Society was held March 2d, at the Surgical Institute. The attendance was sufficient to comfortably fill the apartment where the sessions of the society are held. Besides the regular members there were twenty visitors present. Dr. Ford, the Vice-President, presided in the absence of President Gleason. Dr. Lucy, who had been appointed to read a paper, excused himself from the duty, saying that physical disability had prevented him from preparing it.

Professor Ford said that, since the society was thrown upon its own resources for this evening, he would ask some questions, which he proceeded to do, as follows: Why are live geese feathers considered better than those taken from dead birds? Why is the fur upon skins taken from live animals considered better than that obtained from dead ones?

Several members volunteered to examine the microscopic structure of fur and feathers under the two conditions named, and report at the next meeting.

An interesting discussion then arose as to whether there existed a development of muscular cell structure in animals after death. Dr. Lucy had witnessed cell reproduction in plants severed from the root, under the microscope, but never in animals.

Plans for examining living, animal, muscular structure under the microscope, were suggested.

Prof. Ford, Dr. Lucy, Dr. Krackowizer, Judge Dexter, J. G. Lowman, and the secretary, canvassed the causes that led to the budding and growing of the branches from saw-logs, in the spring, after having laid in the yard during the winter. Why should they put out life at any particular time—as when growing trees shoot out buds? Why not a month earlier or a month later? Why not in the winter, when kept in a warm place?

A committee consisting of the secretary, Judge Seymour Dexter and F. G. Hall were appointed to make arrangements for a reception to be given by the society some time in April. The committee

was directed to report at the next meeting and submit plans and a date. The occasion will be made a profitable and pleasant one.

Several excellent mounts of the minute anatomy of the fly prepared by one of the members, were exhibited. A mount of young oysters, in motion, was also shown.

The society then adjourned to meet the last Thursday in March.

THAD S. UP DE GRAFF, Sec'y.

CAMDEN MICROSCOPICAL SOCIETY.

At the meeting of the Camden Microscopical Society, Isaac C. Martindale read an interesting paper on "Cell Structure in the Vegetable Kingdom." He said he had no new points to introduce, he merely wished to show the commoner things in life.

Few who love flowers, and attend them daily with care, know how they grow, or seldom think of the life that is within them; few know how vegetable growth is made. The earlier scientists traced the vegetable growth backward to the elementary; while the modern begin as far back in the elementary life as possible, and trace the growth through various stages to its completed development. What a plant is, is still a question in botany, and all that is referred to in this paper is on a theory, seemingly proven by the use of the wonderful power of the microscope, yet it is far beyond our comprehension, a confirmation of the declaration "thus far, no farther." Growth is apparent as brought to our view, and some growth is made before we can see it. The first we know, is a cell being formed from a fluid containing sugar, gum and mucous, a wall being formed around this cell that is permeable, and thus we have a completed structure. First a conglomerate mass, incapable of motion, but endowed with life, expanding and enlarging until a cell wall is formed.

The law of natural shape of natural objects is spherical, a multiplication and division of cells form different shapes and this makes up all vegetable growth. A fragment of leaf, bark and root are formed by cells. This cell wall is perfectly closed, yet permeable by the water that surrounds the cells which comes in with a force that generates a circular movement, a movement that is necessary to all life. The *anacharis*, common along our streams, shows this

circulation beautifully. As soon as this rotation ceases the plant is dead.

In woody growth these cell walls become thickened and almost solid, which gives strength to the forest trees and allows upright growth. The life of vegetation is within itself: one portion may die and the remainder may retain its function unimpaired. The body may die, but the germ remain alive. In simple plant life a portion may be separated and a distinct plant grow from the slip. In compound vegetation there is really no necessary death, trees are known to be 3000, some 5000 years old; they would never die except from injury. Changeableness of seasons arrests growth, so we have periodical growth, and the rings are formed plain enough to be counted, and the great age of trees learned thereby. Rarely more than one ring is formed in a season, but it varies in development, the north and south side while not explained perfectly, making a difference. A rapid growth is not as durable as one slower and more compact. Every species has a uniform law, and may be easily recognized the world over. The lecturer explained the malformation of plants, both herbaceous and woody, and gave a beautiful description of our giant trees in California.

The audience was evidently pleased and instructed by the lecturer. After the completion of the lecture, his points were very plainly and beautifully illustrated by a number of microscopes, under which were placed various specimens of vegetation.

Mr. Martindale's instrument showed the cyclosis, the circulation around each cell being distinctly visible.

Prof. Kain displayed desmids, Mr. Derousse a specimen of fern leaf, Mr. Charles Bowdin a section of clematis, Dr. Brown a section of our linden tree, Mr. De Lacour the honey comb structure, which attracted the ladies on account of its beautiful color and formation; Mr. William D. Clark displayed a specimen of volvox globator, and Mr. William H. Morrison gleocapsa.

All who attended were benefitted.

Selections.

THE METEORITE.

BY J. F. TROWBRIDGE.

[The discovery, by Dr. Hahn, an eminent German geologist, of organic remains in meteoric stones, is one of the most astonishing achievements in modern science. By examining a great number of meteorites, he claims to have determined about fifty species of corals, crinoids and sponges, bearing a close relation to similar classes of fossil forms on our earth. The inference from which seems conclusive, that these stones aro really fragments of a dismembered globe.]

From the ruins of what world,
From what splintered planet hurled,
Hast thou journeyed to our own,
Thou mysterious alien stone?

By what orb's conflicting course,
By what mighty cosmic force
Far transcending finite thought,
Was the awful havoc wrought?

Of that ruin, of that wreck,
Indistinguishable speck,
Lost in unillumined space,
Where light, passing, leaves no trace,—

Where through the darkness shines the sun,
Bearing warmth, but yielding none,
Where there is no day nor night,
Up nor down, nor depth nor height,—

Ages upon ages lost,
Till thy path our orbit crossed,
In thy wanderings thou has known
Solitude, thou lonely stone!

Smitten into sudden glare
By our planet's shield of air,
Thy cold, rayless clod became
A fierce meteor, trailing flame.

Men beheld thee from afar
Starting like a falling star,
Heard thy roar, and watched thy flight,
Rushing through the red-lit night.

Such the fury of thy speed,
They had barely time to heed,
With wild eyes to gaze and hark,
Thou hadst fallen, and all was dark.

Half in fiery trains consumed,
Through the fault which they illumed,
Scared, encrusted, scarred and rent,
Here at last thou liest spent.

With all objects strange and rare,
Brought from ocean, earth and air,
Grouped in this historic hall,
Thou the strangest of them all!

Art thou of that swarm of stars
Which, beyond the ring of Mars,
Through the path of one destroyed,—
Thou a small strayed asteroid?

To this tranquil resting-place,
From some ocean spilled in space,
On some old dismantled world,
Through what unknown cycles whirled!

Was the orb of which thou art
But this rude, imperfect part,
Furnished and arrayed as ours,
Fanned by winds and swept by showers?

Were there mountains there, and trees?
Islands set in azure seas?
Curving waves, whose forming crest
Broke in beauty on thy breast?

And did life, upon that sphere,
Mount in myriad forms as here,
By the same eternal laws,
Pulsing from one Primal Cause?

Did the world-force, which began
Low and darkling, climb to man,
Flower in thought and crown the whole
With the glory of a soul?

And was evil there, and wrong?
Were there races weak and strong?
Many-peopled lands and climes?
Were there passions? were there crimes?

Tyranny, and caste, and slaves,
Was there marriage? were there graves?
Art and song and science known?
Yield thy meanings, mystic stone!

Vain the yearning, all in vain
Is the soul's ecstatic pain,
Wrestling with eternity
For intelligence of thee!

Where thy home and native skies
Mind is powerless to surmise;
Still the thought will burn and beat,
Still we ponder and repeat,—

From what shattered system hurled,
From what planet, from what world,
Hast thou wandered to our own,
Thou mysterious alien stone?

—*Youth's Companion.*

NOTES ON THE SPONGILLÆ OF BUFFALO.—The presence of sponge in most diatomaceous deposits has led to the conclusion that sponges themselves may be looked for in all perennial, running streams, brooks or lakes. Facts of almost daily occurrence prove this conclusion to be correct, for whenever intelligent search has been made at the right season, the search has not been in vain. Among the first objects found in the microscopic examination of water from Niagara river were these transparent, pointed, slightly curved bodies, which the experienced microscopist recognizes as proof of the near presence of sponge. In October of 1879, Mr. D.

S. Kellicott found the first specimen, on the pier at Black Rock, near Squaw Island. Subsequently three other species have been found by him and myself. One of them, we think, is new to science. All were named numerically, in the order found, till they could be identified.

No. 1. This most abundant species has been identified as *Spongilla asperima*, Dawson.

No. 2, *Carteralla tubisperma*. The specimens of this sponge found previous to the present season (1881) were so small and fragmentary that but a poor idea of its character and growth is given in my presentation of it, in a paper read before the Buffalo Microscopic Club in April, 1880. During October of this year I found it in large pieces, attached to weeds, under and upon rocks and stones and pieces of wood. In one or two instances I have found it as large as one's hand, and an inch and a half thick. It is generally green, but not always.

No. 3 is difficult to describe from specimens found in our locality. The action of the water upon the rocks where it is found is so great as to take away all the upper part of the sponge. We have identified it, however, with a species found in Philadelphia and named by Dr. Leidy *S. fragilis*. The ovarian capsules of statoblasts lie close together in a mass, encrusting rocks or any object in its way. Above these, and enclosing them, is the sponge proper, made up of spiculæ sarcode and other elements that constitute the spongillæ.

No. 4 is identical with a specimen found in the Ottawa river by Mr. Geo. Dawson, of Montreal, and named by him *S. ottawaensis*. From some cause it does not grow large in this locality. I found the largest pieces during last October that have been found. These were quite fragmentary, the sponge having been pierced through and through with numerous worms and other carnivorous animals that feed upon it.

Since penning the above, two other species, new to us, have been found in this neighborhood; one by Mr. E. S. Nott, of Hamburg, N. Y., and the other by myself in Niagara river. The one found by Mr. Nott, and sent to me for identification, I took to be *Spongilla Carteri*, a species hitherto only found in Bombay, India. But, on a more thorough examination and subsequent comparison with a type-specimen from Mr. Carter's collection, I conclude that

it is another species, probably new and undescribed.—Abstract from article by Henry Mills in *Bulletin of Buffalo Society of Natural Sciences.*

[The editors regret that lack of space necessitates a brief abstract of this valuable article.]

AID OF THE MICROSCOPE IN THE DIAGNOSIS OF DISEASES.—Parasites in the intestines of all animals are developed, and they feed upon the system, and, if too numerous, cause disease and death. Parasites in the intestines of children and aged persons are very common, and if very numerous prove fatal. These and many others are visible to the naked eye. Had we the visual power to see all things as though we were looking through a microscope of high power, we would be amazed at the numerous animal life that is not visible to the unassisted eye. The air we breathe, the water we drink, and the food we eat is contaminated with bacteria, which poisons our systems and sows the seeds of disease, and in many cases death is the result. A lady some time ago sent me a slice of cold bacon ham for examination under the microscope, and stated that her family had been eating the ham, and that some of them were sick, and that she was fearful the ham was the cause. The ham had the appearance of having been sprinkled with fine black pepper. I scraped off some of it and placed it under the microscope, and it revealed animal life in abundance, and so active as to move from under the field of the glass. I have examined quite a number of specimens from different hams of bacon that had been boiled some days, and found the same peculiar animalculæ.

The microscope is the only means by which trichinæ can be detected. They are not visible to the unassisted eye. I have found bacteria in the vomited matter from patients suffering from typho-malarial fever, and by experiments with different chemicals I ascertained what would destroy them, and the patient recover very rapidly under its exhibition.

By the aid of the microscope we can detect bacteria in the urine of patients suffering from acute or chronic cystitis, and by experiments with chemicals ascertain what will destroy them, and the patient speedily recover under its use.

A gentleman called on me a few months ago and stated that he had been under treatment for stricture of the urethra for the last 12

months, and that he was no better than when the treatment was begun. The mode of treatment that he had been under was dilitation.

By an examination of his urine under the microscope I ascertained that he was laboring under a slight chronic catarrh of the bladder, and the urine contained bacteria, which was keeping up the irritation.

By the aid of the microscope we have ascertained that the so-called "fur" on the tongue of patients is due in a great measure to certain forms of "fungi."

Dr. Hunter, a German savant, has devised a simple arrangement which demonstrates the circulation of the blood by making it visible.

Dr. Hunter's method is as follows: The patient's head is fixed in a frame, on which is a contrivance for supporting a microscope and lamp, his lower lip is drawn out and fixed on the stage of the microscope by means of strips; the inner surface must be uppermost, and having a strong light thrown on it by a condenser.

When these preparations are completed, all the observer has to do is to bring the microscope to bear on the surface of the lip, using a low power objective, and focussing a small superficial vessel. At once he sees the endless procession of the blood corpuscles through the minute capillaries, the colorless ones appearing like white specks dotting the red stream. He asserts that from taking careful notes as to variations in the blood-flow and changes in the corpuscles, he has derived great advantage in the treatment of those diseases.

The valuable assistance derived by the aid of the microscope in diagnosis of the kidneys and bladder is very great. I consider it indispensable in the successful treatment of those diseases.

For instance, chronic Bright's disease of the kidneys can be distinguished from an acute case. If we find renal casts and blood in the urine of a patient, it indicates a disease of a recent date, but if we find transparent or waxy casts, it indicates fatty degeneration of the kidneys.

If blood is from the kidneys, the corpuscles are equally diffused through the urine, but if from the bladder or urethra, the color is "pinkish or vermillion," and contains clots. If we detect uric acid crystals in the urine before it gets cold, or within six hours after it has been voided, the patient is in danger of having a calculus form in the bladder. This can be ascertained by the aid of the microscope, and then we can give remedies that will avert it. By the aid of the microscope we can detect a malignant tumor from a benign one, and pus from a strumous patient from that of a healthy subject. —Extract from an article by W. S. Ross, M. D., in *Western Medical Reporter*.

Reviews.

HUMAN PHYSIOLOGY: Designed for the use of Students and Practitioners of Medicine. By John C. Dalton, M. D., Professor of Physiology in the College of Physicians and Surgeons, New York pp. 722.
Philadelphia: Henry C. Lea's Son & Co. 1882. Seventh edition.

The general practitioner does not desire an extended review of a work of this character and the student only desires to hear the announcement that the work has been thoroughly revised to avail himself of it. We have recommended this work to our students for years and shall continue to do so.

The most marked changes in this edition that we have noticed refer to the nervous system. This part of the work has been brought up to the standard of the present time, and aids in maintaining the book as one of the best authorities.

THE MICROSCOPE: Its Revelations with some of the Bearings upon Christian Evidences. Hon. Thomas B. Redding, Ph. D., Newcastle, Indiana. pp. 20, 8 vo. A lecture delivered in the Acton lecture course

This is a very pleasing address indeed. The author discusses, in a very intelligent way, the relations of low to higher forms of matter, the processes of growth and multiplication; in all these things "faith beholds modes of Divine action."

SIXTH BIENNIAL REPORT OF THE ILLINOIS NORTHERN HOSPITAL FOR THE INSANE: Elgin, Ill.

The part that especially interests us is the method given for hardening nervous tissues and cutting sections of the same. The fresh tissue is hardened with alcohol, from weak solutions to full strength. The whole brain is hardened by putting it in a 33 per cent. solution of alcohol to which five grains, to the ounce, of ammonic bichromate has been added. This mixture is injected into the vessels of the brain also. Dr. Woodward's voilet-carmine is used for staining; oil of cloves for clearing,and balsam and benzole for mounting. Photo-micrography is successfully employed here also.

Dr. C. A. Kilbourne is in charge.

AN EXPERIMENTAL STUDY ON THE ACTION OF SALICYLIC ACID UPON BLOOD-CELLS AND UPON AMŒBOID MOVEMENTS AND EMIGRATION: By T. Mitchell Prudden, M. D., Lecturer on Histology in Yale College; etc.

A careful study. The author shows that salicylic acid restrains emigration, and is inimical in strong solutions to the life, and in weak solutions to the activity of the white blood-cells.

PRIMER OF THE CLINICAL MICROSCOPE. By Ephraim Cutter, M. D., Boston. Chas. Stodder. Price 50 cents. 8 vo. pp. 32.

The author asks a large number of questions and then proceeds to answer them. While it is a primer yet there are plenty of crumbs in it for us all to pick up.

THE MICROSCOPE

AND ITS RELATION TO

MEDICINE AND PHARMACY.

VOL. II. WHOLE NO. 8. | Ann Arbor, June, 1882. | No. 2.

CONTENTS.

Original Communications.

THE HISTORY OF THE MICROSCOPE AND ITS ACCESSORIES.

BY J. W. CRUMBAUGH, M. D.

FIRST PAPER.

MY apology for presenting this series of articles to the readers of THE MICROSCOPE exists in the deplorable ignorance of the great majority of microscopists of the facts herein contained.

"The history of the microscope like that of nations and arts has had its brilliant periods, when it has shown with uncommon splendor and been cultivated with extraordinary ardor; these have been succeeded by intervals marked with no discovery and in which the science seemed to fade away or at least lie dormant, till some favorable circumstance, the discovery of a new object or some improvement in the instrument reawakened attention and animated researches.[1]" Dr. Priestley says in excuse for the production of his work,

[1] George Adams Jr., "Essays on the Microscope" 1787.

that in order to facilitate the advancement of all the branches of useful science, two things seem to be chiefly necessary. The first is an historical account of their rise, progress and present state; and the second, an easy channel of communication for all new discoveries. Without the former of these helps, a person every way qualified for extending the bounds of science, labors under great disadvantages; wanting the lights which have been struck out by others, and perpetually running the risk of losing his labor and finding himself anticipated in the discoveries he makes, which is a great mortification and discouragement. In other respects, also, the progress of natural knowledge is retarded on this account; so that in the present state of science such histories as these are in a manner absolutely necessary.

"Considering how very few persons are acquainted with the present bounds of any branch of science, or, indeed, are in circumstances in which it is possible for them to acquire that knowledge, and how much time and labor are even, in that case, necessary in order to acquire it, it must be allowed that were these histories judiciously compiled real discoveries would be much more numerous; and were these again easily and expeditiously circulated the progress of knowledge might be accellerated beyond what we now can conceive.[1]"

Our numerous and valuable scientific and popular-science journals afford the "easy channel" much longed for by Priestley. But no one from his day (1772) until Queckett's time (1848) attempted to continue the good word so ably begun by the renowned Priestley. Even in the works of to-day if any reference whatever is made to the history of the instrument it is of the most cursory character and then filled with inaccuracies. It shall by my endeavor therefore as far as lies in my power to confine myself to extracts from the original authors. Even so careful an historian as Dr. Priestley I will discard when the originals from which he compiled are attainable.

I am persuaded too that ere we finish our studies of this subject my readers will, with me, be ready to endorse the proposition formulated by Aristotle over two thousand years ago that "probably all art and all wisdom have often been already explained and again quite forgotten."

[1] Priestley's "History of Optics."

Microscope, the name by which our instrument is known is a word derived from two Greek words signifying "to view small things." Demisianus is said to have first suggested this as the name for the instrument.

The use of the microscope antedated by hundreds of years a thorough appreciation of the optical principles involved in its construction. This is evidenced by the finding of a lens of rock crystal[1] in the ruins of Ninniveh.[2] Aristophanes, four hundred B. C. also mentions burning spheres as being for sale in shops at Athens. That their magnifying power was known seems certain from the fact that designs were wrought on metal that to the naked eye are confused markings but with the aid of a magnifier develop into beautifully carved groupings. A seal once belonging to Michael Angelo of very ancient origin now in the French Cabinet of Medals has engraved in a space of fourteen mm. diameter fifteen figures and none of them discernable by the naked eye. Does it not seem rational to suppose that these pieces of work required the aid of a lens both for their execution and appreciation. Then too we find various passages in works of Jamblichus, Pliny, Plutarch, Seneca, etc., showing almost certainly they were possessed with apparatus that enabled them both to see distant objects and to magnify small ones. Unless we place this construction on them they would be absurd. Pisidias who wrote sometime during the seventeenth century says, "You see things future by a dioptrum." We know of nothing by which things at a distance can be represented as near at hand, save the telescope. Seneca[3] writing during the first century affirms distinctly "that letters though minute and obscure appear larger and clearer though a glass bubble filled with water."

The first remark that I can find which can be construed into a reference to the chief optical property of the microscope, viz., refraction, is by Archimedes in the third century B. C. He is said to have written a work on the appearance of objects under water and therefore could not but have mentioned refraction and the

1 Exhibited by Sir David Brewster 1852 to the Royal Society.

2 Ninniveh in glory seven hundred B. C., and so completely destroyed four hundred B. C., that Xenophen makes no mention of it though he led ten thousand Greeks across its former site.

3 Nat. Inest. Lib. 1 Cap. 7.

errors of vision arising therefrom. The first actual mention of facts known concerning refraction and reflection however is by Ptolemy in about the middle of the second century A. D.

In Knight's Mechanical Dictionary we find (without dates or authorities) that the magnifying power of glass balls was known in the very early time to the Chinese, Japanese, Assyrians and Egyptians and more recently to the Greeks and Romans. He states too that lenses for microscopical purposes long preceded their application to telescopes.

As further evidence of the knowledge of the ancients concerning the burning and magnifying power of lenses, Priestley thinks (Optics p. 8) it is hardly possible for those frequently handling the gems fashioned in spheres or as lentils, now seen in cabinets, could possibly have escaped noticing their magnifying or burning power. Some of them are supposed to be traceable to the Druids. One of spherical form of about one and one-half inches in diameter can be seen among the fossils given to the University of Cambridge by Dr. Woodward.

On theoretical optics, Aristotle, B. C. fourth century, wrote largely. Archimedes as before stated also wrote. But from Euclid's time to that of Seneca[1], who lived about 65 A. D., there appears nothing on this subject. Seneca gave us nothing new, but redresses the crude sentiments advanced years before by Aristotle. The first important advance made in this science was by Ptolemy at time before mentioned.

After Ptolemy came a dark age in Europe, during which time the sciences were cultivated by the Arabs chiefly. The first writer according to Priestley (p. 19) was Al. Farabi, who lived 900 A. D., but of his works we can find no trace. In the year 1000 A. D., Ebu Haithem wrote largely on this subject, but his work is also lost. The only work left us from the Arabian philosophers was by Alhazen's pen, who flourished during the 12th century. It is in this work that we find a distinct account of the magnifying power of glasses, and it is supposed by some that what he wrote on the subject was the incentive to the invention of spectacles. He describes the effect on objects when placed close to the base of a larger seg-

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1 Quest. Nat.

ment of a sphere and of a whole sphere, and lays claim to being the first to notice the refraction of rays into it.[1]

Vitellio, a native of Poland, followed Alhazen by publishing a work illustrative of his predecessor in 1270. His work contained all that was valuable in Alhazen's, and much that was new. He makes mention of the fact that light is lost by refraction and reflection, and that as a consequence bodies viewed by lenses appear less luminous.

Ten years later there is added to the stock of books, but not of knowledge a work from the pen of the Archbishop of Canterbury, Peccani.

Roger Bacon, a Monk, writing at same time, also fails to add to our meagre stock of information. Reasoning from some of Alhazen's statements, of whom he was a close student, he deducted as follows: "When an object is placed nearer to the eye than the center of sphere of which the interposed glass is a lesser segment and the convex side toward the eye, everything concurs to magnify it. For, the angle under which it is seen is greater, the image larger and place of the image nearer. Therefore, this instrument is useful to old people and those who have weak eyes; for by the help of it they may see the smallest letters sufficiently large."[2] It is supposed that the statement, plus Alhazen's remarks, were the immediate forerunner of spectacles. At all events it is certain that specs came into use about this time.

Bacon further says (Opus Majus), deducting from theory of refraction that it was possible by means similar to those used to see small near objects, to see distant ones. This we must acknowledge was a near approach to the theory of both microscope and telescope. I say theory, for it becomes evident from many after statements that he knew nothing of the result of "certain combinations of lenses" practically. Then, too, he never refers to any tests of his theories, which he undoubtedly would, had he made any. How much we have lost in time and results by the lack of practical knowledge on the part of this great genius we can only surmise.

Before going into the next and brighter era, I want to finish with spectacles. As stated, they were in use during the thirteenth century and not long before. In proof of this we have accounts of

1 Smith's Optics

2 Opus Maj., p. 352.

various ones having them in use. One Scarrdro Dipopozzo,[1] an Italian, wrote in 1293 that it was impossible for him to read without his "lunettes," the name then used for glasses or specs. Alex. Spina, native of Pisa, who died in 1315, made specs for himself and afterwards for others.[2] Inscribed on the tomb of Salvinus Armatus, a nobleman of Florence, who died in 1317, is an inscription which ascribes to him the honor of inventing spectacles.

Concave glasses no doubt followed very closely the first use of convex lenses, for Maurolycus, who died in 1575, explains the use of both kinds of glasses and does not mention either of them as a recent invention.

BONE IN THE EYE.

BY H. GIFFORD.

THE following somewhat peculiar case of ossification in the eye occurred in a young man, twenty-four years of age, operated on by Prof. Frothingham, at the Eye Clinic of the University of Michigan, Dec. 21, 1881.

Twelve years before, the eye had been struck by a piece of gun-cap, though the exact seat of the blow could not be ascertained. The eye became blind within three days and from that time had no perception of light. As it was so painful at times it was enucleated to guard against sympathetic trouble.

Immediately after its removal the eye was opened by a longitudinal section, as the gun-cap was supposed to be within, but this proved not to be the case. The eye was then hardened in alcohol and re-examined with the following results: Bulb, somewhat irregularly atrophied, 14 mm. in diameter, sclerotic much thickened, 2 mm. thick in posterior hemisphere; retina closely adherent to the choroid; vitreous liquefied. In the place of the lens was a nucleus of solid bone, about 5x2 mm, surrounded by a thin layer of osteoid tissue, the remainder of the lens-form being filled out with a finely fibrillar structure, containing numerous round and fusiform but apparently no branched cells. The iris and ciliary processes were

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1 Lunette Encyclopédie on Dictionairé Raisonné, 1780.

2 Smith's Optics.

attached to about ¼ the circumference of this lens-shaped mass, but were otherwise free and intact, as was the cornea. Directly back of this mass, forming almost a complete cast of its posterior surface, but attached to it only by a small cord of what seemed to be ossifying tissue, was a nearly circular piece of bone, averaging about 1 mm. in thickness, and having on its posterior convex surface two sharp processes, the longer of which projected about 3 mm. backward in the direction of the *canalis hyaloidea.* This plate of bone was attached by tough fibrous membrane to the choroid and retina in the region of the *ora serrata,* for about 7 mm ; the rest of its periphery being free. Whether this line of attachment was superior, inferior or lateral, could not be determined, as no attention had been paid to the bearings of the eye, at the enucleation, and it was afterwards found to be so deformed that identification of its original axes was impossible. At some points of its circumference the plate of bone was incomplete ; ossifying membrane taking the place of fully formed bone.

The smaller piece of bone undoubtedly took the place of the central and anterior part of the lens. There could be no possibility of ossification of the vitreous here, as the anterior surface of that body was clearly marked out by a separate piece of bone.

The origin of this second piece could only be conjectured, as no recognizable traces of hyaloid membrane, nor posterior nor anterior capsules, were present. The bone was thickest along the antero-posterior axis of the eye, a fact which, in connection with the spine projecting back at that point, might indicate as the departing point, the junction of the canalis hyaloidea with the layer of the hyaloid lining the fossa patellaris ; granting of course that such a layer exists. On the other hand, the bone may have taken the place of the posterior capsule ; or again, it may have been merely an ossified exudate from the chorio capillaris. The case differs considerably from any that I have found reported. In the cases mentioned by Knapp and Goldzieher (Vols. II. and IX. Arch. of Oph.) of more or less complete bony septa behind the lens, there could be no doubt that the ossification proceeded from the periphery. The occurrence of such a plate

with separate ossification of the lens, also seems to be peculiar.

There can be no doubt as to the genuineness of the bone in this case. Both pieces showed lacunæ and canaliculi very clearly, and the plate showed Haversian canals, with a somewhat concentric arrangement of lamellæ as well. The specimen is in the possession of Prof. Frothingham.

URIC ACID.

BY C. H. STOWELL.

URIC acid is deposited as a sediment only when the urine has an acid reaction. The sediment is never colorless, although it may have but a pale-yellow color. It has, usually, either a deep yellow, an orange, or a brown color. The unaided eye is generally sufficient to identify the presence of uric acid, for it is the only substance giving a spontaneous deposit of brown crystals. The crystals usually lie scattered as colored specks on the sides of the glass vessel, forming also a layer of deposit at the bottom. It appears in many different forms under the microscope, the more common being that of smooth tables of the rhombic form. These rhombic crystals are modified by having their angles rounded off in such a way that spindle-shaped crystals are produced. Other varieties exist, as dumb-bells, six-sided plates, rectangular tables, saw-shaped, fan-shaped, etc. If there be any doubt as to the nature of any particular form it is only necessary to dissolve the sediment on the glass-slide in a drop of potassic hydrate, and then add a drop of hydrochloric acid, when the usual form will appear. Uric acid is insoluble in hot water but soluble in alkalies, potash, soda and ammonia. Some of the sediment, supposed to be uric acid, may be placed on a slide and a drop of strong nitric acid added to it. After evaporating it to dryness, one or two drops of ammonia are added. If a purple-violet or violet-red color appears it denotes the presence of uric acid or a urate. In testing for an excess or for a deficiency of urea the quantity of urine passed in twenty-four hours should be taken into account. If the amount passed be

PLATE IV.

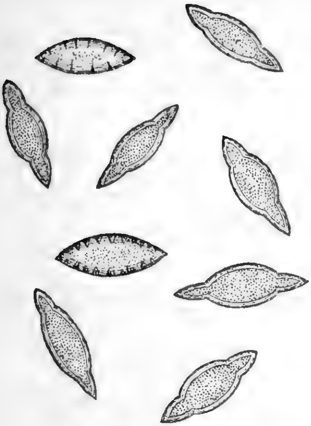


Fig. 1. Uric Acid. X 125.

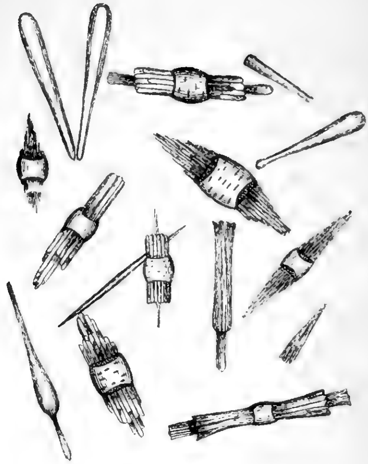
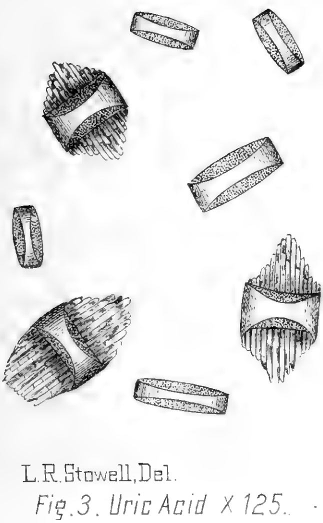


Fig. 2. Uric Acid. X 75.



L. R. Stowell, Del.

Fig. 3. Uric Acid X 125.

Fig. 4. Uric Acid. X 125

below the average it should be diluted with water until it reaches that point ; if the quantity be in excess of this average then it should be evaporated to that point. After proceeding thus, if the urine has a specific gravity over 1030, an excess of urea may be the cause. To test for this, place enough of the urine in a test-tube to fill it an inch in depth; add to this one-third its bulk of pure nitric acid, and set in a cool place, or in cold water, better always in water near the freezing point. If crystals of nitrate of urea form in a few moments then an excess of urea is present. Nitrate of urea crystals are colorless, flat, rhombic or hexagonal plates, closely united to one another.

To test for a deficiency of urea, take some of the urine, of normal quantity, and reduce it to one-half its bulk by slow evaporation; when cool add nitric acid as given above, and set in cool water. If no crystals of nitrate of urea form in five minutes then the normal amount is not present. This is a very simple method, is easily applied, and approximates the true results.

We quote the following from the April number of The Microscope: "The books have been balanced and Vol. I. of The Microscope has closed. The experience of the past year has been of great value to us, and we propose to give our readers the benefit of it, by offering to them a much better journal. The unexpected financial success of the enterprise proves that there was a demand for a practical help of this kind. Therefore we say to all our friends, give us your aid for another year—by getting your friends to subscribe and by contributing practical articles to our columns." The Microscope is worthy of the encouragement and support, not only of those interested in its immediate object, but of those desirous of aiding an attempt to materially benefit the University. May it have many birthdays of financial and well merited success.—*The Chronicle.*

Society Proceedings.

CAMDEN MICROSCOPICAL SOCIETY.

At the regular stated meeting of the Society, held last night, Mr. Bingham called attention to the fact that the buds of the *Magolia Conspicua* all point toward the north, the explanation being that the sun shining on the south side of the bud causes it to develop faster on that side and thus curve toward the north. Dr. Gross suggested that it would be well to ascertain whether the annular rings are not larger on the south side of the plant. Mr. Bingham also called attention to recent observations in regard to the presence of bacteria in the blood of patients suffering from malaria fever. An interesting debate followed, which was participated in by Drs. Gross, Robinson, Howard and Quint.

The subject of the evening—"Photo Micrography"—was then discussed by Mr. Kain. He spoke of the fact that, in the works which treat upon the subject, the matter had been so surrounded with difficulties that the ordinary microscopist was discouraged at the outset. The recent improvements in dry plate photography, however, have so simplified the process that it is now within the reach of every working microscopist.

The following were enumerated as some of the advantages of the dry-plate process:

First—Its convenience. The worker finding an object which he wishes to copy, simply exposes a plate, and if not convenient to develop it at that time it can be laid away in a dark closet and developed at leisure, even though an interval of weeks might elapse.

Second—The dry plates are sensitive in no small degree to yellow light, and as a large number of microscopic objects are more or less yellow, this property is invaluable.

Third—The light of a kerosene lamp is amply sufficient for photographing all objects that require a power not greater than a quarter inch objective.

Fourth—The cost is trifling, the essential apparatus not requiring an outlay of more than fifteen dollars.

Two objects, the foot of a spider and the saws of a saw-

fly were then photographed, Carbutt's "J. C. B." plates, one inch objective and an A eye-piece, the exposure given being four and a half minutes. The lights were then extinguished and the room lit by means of a red lantern. The plates were then developed, the ladies and gentlemen present clustering around the table to observe the process. After fixing and washing the plates the gas was relit, and an examination showed that the negatives were excellent, every detail being fully brought out.

LAST evening there was quite a good attendance at the hall of the Microscopical Society to listen to the address of Mr. John Carbutt, of Philadelphia, upon the subject of Photo-Micrography. A number of scientific gentlemen from Philadelphia were present. Mr. Carbutt was one of the original members of the Illinois State Microscopical Society, and, besides his interest in microscopy, he is also well known throughout the country as a skillful photographer and one who has done so much toward the popularizing of the dry-plate process. In his lecture of last evening he spoke of the peculiar adaptability of the dry plates to the wants of the microscopist, on account of their extreme sensitiveness, and the fact that they can be so easily manipulated even by those without previous experience. The arrangement used for photographing was remarkable for its simplicity and inexpensive character. It consisted of a board about four feet long, with a ledge around it in which was fitted a sliding-block to which the camera was attached, another for the microscope, and one for the lantern, all adjusted to a proper height. The microscope was attached to the camera by means of a rubber sleeve connecting with a conical tube about fourteen inches long. The lantern used was invented by the lecturer, and it is really a *multum in parvo*, for, while it gives an unusually brilliant light for photo-micrographic purposes, it at the same time furnishes a perfectly safe light to develop plates by.

With a two-inch Bausch & Lomb objective, and an exposure of two minutes, a negative was taken from a spider's foot. With the same objective, and an exposure of one minute and a quarter, one was also taken from a sheep's tick, "B" plates being used in both instances. The shorter exposure in the latter case was in consequence of the object being much less dense and yellow. Upon being

developed, both plates showed that the exposure had been correct, every detail being fully brought out. Removing the microscope, the process of making positives for the magic lantern was then shown, and attracted all by its simplicity. A negative being placed in the printing frame, the lantern was closed so as to emit only red light.

An "A" plate was then laid upon the negative and the frame closed. A door of the lantern was then opened so as to emit the full light of the flame, and the plate exposed twelve seconds. The door being closed, and the room again illuminated only by red light, the positive was then developed and afterwards shown upon the screen by means of a sciopticon.

At the conclusion a vote of thanks was given to Mr. Carbutt for his very interesting and instructive address.

By request Dr. Robinson will address the Society on Thursday evening, June 1, upon the subject of the "Microscope in Medicine."

On the evening of May 25th, the Third Annual Soiree of the Society will be held at Morgan's Hall, when it is expected that the societies of West Chester and Lancaster will be present, also the Biological Section of the Academy of Natural Sciences, of Philadelphia.

GRIFFITH MICROSCOPICAL CLUB OF DANVILLE.

The regular meeting of the Griffith Microscopical Club of Danville was held April 21st. The president, the Rev. F. W. Taylor, read a paper on the "Single Staining of Vegetable Sections" which was intended especially for those just beginning work and was full of useful knowledge and valuable hints from the writer's own experience. After the reading of the paper and the questions and discussions which followed the members settled themselves for work during the remainder of the evening, staining and mounting some very beautiful transverse sections of various plants and proving to their own satisfaction the relative value of carmine and hæmatoxylin in such sections. The meeting adjourned to the third Friday in May.

THE BUFFALO MICROSCOPICAL CLUB.

The regular meeting for April was held on the second Tuesday of the month. President Henry Mills in the chair.

Dr. W. C. Barrett presented a paper upon "The Cell Dogma," with a tabular review of the dates, names and publication of the most important investigations. The theories and discoveries of Schneider, Wolfe, Goodyear, Huxley, Todd, Bowman, Beale, Virchow and other writers were detailed and considered. The paper ended with the investigations of Heintzman and his conclusions regarding the structure of protoplasm and the true nature of cells.

The paper was warmly discussed and the investigations and conclusions of Heintzman questioned. The subject was finally laid upon the table for discussion at the next regular sesison to await the results of investigations then under way.

Upon motion, Dr. Geo. E. Fell and Prof. D. S. Kellicott were elected delegates to attend the *soireé* of the Elmira Mic. Society.

LEE H. SMITH, M. D.,
Secretary.

SCIENCE AND CONSUMPTION.—Prof. Tydall has made public in England the results of experiments made by Dr. Koch, of Berlin, on tubercular disease. It was known before that the disease was communicable, but Koch has ascertained the exact nature of the parasite which causes consumption. He propagated it artificially and killed animals with parasites thus produced. The matter expectorated from the lungs of consumptive persons has been found to be swarming with parasites which are highly infective. Tyndall's object is to protest against legislation which prohibits in England experiments such as enabled Koch to make these discoveries; but it is hoped that Koch will develop a harmless form of the tubercular parasite which, by inoculation, may prevent consumption, and thus check a scourge which, according to Koch's calculation, carries off one-seventh of the human race.—*Ex.*

Correspondence.

SOIREE OF THE ELMIRA MICROSCOPICAL SOCIETY.

Dear Doctor:—The soiree was given in the large lecture room of the Park Church. Tables were arranged against the four walls of the hall, with settees four feet distant, forming a pathway around the entire room. In the centre of the hall, no seats were permitted. Here the vast audience accumulated and chatted until an opportunity offered to join the procession marching in the aisles formed about the tables and instruments. Fifty-two microscopes exhibited the objects catalogued in the neat sixteen-paged programme. The home society was aided in its exhibition by the following gentlemen from a distance, who not only brought their elegant stands, but contributed specimens of their handiwork.

Dr. Lewis M. Eastman, of Baltimore, Md., whose animal sections and exquisite mountings are a delight to behold.

W. H. Walmsley, of Philadelphia, with a full line of R. & J. Beck's microscopes, including the magnificent International Binocular. This gentleman also exhibited his method of making microphotographs by a simple device and by ordinary lamp light.

Rev. J. T. Brownell, of Mansfield, Pa., brought his beautiful mounts of pollen, in the mounting of which he has no superior.

Mr. Edward Bausch, of Bausch & Lomb Optical Co., Rochester, N. Y., showed the several styles of microscopes made by that enterprising firm. Their new large microscope, just finished, but not yet named, was shown for the first time. It has many new and valuable features, which so pleased Dr. Eastman that he exhibited his appreciation of it by ordering one on the spot.

Dr. Geo. E. Blackham, of Dunkirk, N. Y., President of the American Society of Microscopists, brought his large Tolles-Blackham microscope, and contributed largely and enthusiastically to the success of the entertainment.

Dr. Geo. E. Fell, of Buffalo, N. Y., Treasurer of the American Society of Microscopists, also kindly journeyed to us, showing the circulation in the tongue and foot-web of an immense bull-frog.

E. H. Griffith—"Uncle Griffith"—as he is affectionately known to the Elmira society, honored us by coming from the far west, that

he might take part in the exercises. Not being on the programme, he ran what he called, a "little side show" of his own, and kept his four Griffith stands on duty, delighting all who could get near enough to him.

The soiree was the first given by the society, the visitors being admitted only by cards of invitation. Six hundred of these cards were issued, and, judging from the throng of people present, every one was presented.

The committee having the soiree in charge, calculated that not more than one half the invitations would be accepted. Therein their judgment was at fault, the hall being so crowded that many visitors left without securing a sight at the many beautiful and interesting objects offered for inspection. The occasion, however, was valuable to the society in that it manifested the interest taken in microscopical matter, by the citizens, and taught them also how to manage the next entertainment of this sort. Indeed, the soiree was regarded as a preliminary "skirmish" that would lead to a more successful "engagement" in August next, when the American Society of Microscopists will hold their annual meeting in Elmira, at which time a much larger and better managed soiree will occur.

In this connection, let it be known that the Elmira society are making arrangements to give the National Society a grand welcome. All members of said society will be entertained by the local society, and will be further treated to an excursion and banquet, the details of which have not been fully arranged, but will be sent you in due time. If you would have a royal time, do not fail to visit the Elmira society in August next. T. S. U.

To the readers of "The Microscope."

The fifth annual meeting of the American Society of Microscopists will be held in Elmira, N. Y., beginning Tuesday, August 15th, 1882, and continuing four days.

The local committee are making very liberal arrangements for the comfort, convenience and entertainment of the society and desire early information as to the probable attendance. Members (and those who desire to become members) are therefore requested to notify Dr. Thad. S. Up de Graff, Secretary Elmira Microscopical Society, of their intention to be present.

Members of the society (present or prospective) who intend to present papers or communications at Elmira are earnestly requested to send titles, and, if possible, abstracts, as soon as possible to Prof. D. S. Kellicott, Secretary A. S. M., 119 Fourteenth street, Buffalo, N. Y. A blank for this purpose is enclosed herewith and additional copies can be obtained from the secretary on application.

A blank form of recommendation for membership is enclosed and additional copies can be obtained from Secretary Kellicott on request. Members are reminded that increase of membership means increase of working power for the society and are therefore urged to promote the growth of the society by recommending suitable persons for membership as well as by contributing the results of their microscopical work to the society's proceedings.

There is now every reason to expect that the Elmira meeting will be in completeness and convenience of arrangements, number of members present, and number and scientific value of papers read, the most successful in the history of the society up to the present time, the list of papers already promised is larger than at any previous meeting, the display of instruments, accessories and objects on the part of private members, as well as by makers and dealers, is expected to be unusually rich and elaborate, and the reports of the committees "On Eye Pieces," "On Revision of the Constitution" and "On the Question of a Quarterly Journal," will be of special interest.

Members who cannot prepare elaborate papers are requested to be prepared to give brief verbal notes cn practical points, which will be (with the discussions on the papers) fully reported by a competent stenographer.

Microscopists generally are cordially invited to be present at this meeting to join the society, to contribute to its proceedings and to avail themselves of the opportunities offered by mutual acquaintance and the interchange of ideas and objects.

GEO. E. BLACKHAM, President.

MOORESTOWN, N. J., May 5, 1882.

Editor of The Microscope:

SIR:—I noticed in the February issue of THE MICROSCOPE an article by Mr. W. H. Walmsley, on the preparation and mounting

of microscopic objects. In it he alludes to a punch for cutting wax cells. He does not, however, mention the inventor of this punch. I am glad that I can add to the interest of the article by so doing. The punch was the invention of Prof. C. H. Kain, of the Camden Microscopical Society. The idea was worked into shape by a workman now in the employ of J. W. Queen & Co., of Philadelphia. From what I can learn they were first put upon the market by the same firm, and as they were not patented, have been made and sold by all the dealers in microscopical accessories. I write this as I believe in the old saying, "Honor to whom honor is due."

WM. J. MORRISON.

Editorial Department.

THE demand in the Northwest for a Summer Educational Institute has been met by establishing a school at Petoskey, Mich. The location chosen we believe to be a most happy one. The cool spring water and the pure bracing air have already made this young place a favorite retreat during the warm months. The constant lake breezes come over a hundred miles or more of fresh water and are as pure and invigorating as can be found.

The faculty is composed principally of teachers from the State University and Normal School.

Instruction will be given in language, literature, art and science.

The editors of this journal come in for their share. Mrs. Stowell will have entire charge of "Microscopy."

The instruction in this department will be conducted by means of daily lectures and class-room work. Each student will be provided with all necessary instruments.

The manipulation of the microscope, and the preparing, cutting and mounting of sections will form a prominent feature of the course. A large number of sections will be mounted both from the animal and vegetable kingdom. It is intended to make the student generally familiar with microscopical work and to give him an opportunity of obtaining a large number of valuable mounts.

Dr. Stowell will conduct the department of "Physiology and Histology" by means of daily lectures and class-room work. The object of the course will be to familiarize the student with the general structure of The Human Body, with the functions of its various organs and tissues, and with its minute structure as revealed by the microscope.

With the aid of models, diagrams, and microscopes, the instructor will be able to render aid to the student in his earnest endeavor to obey the command—"Know thyself."

Special aid will be given to teachers and to those intending to become such.

The Institute commences July 13th and continues for five weeks. For fees, and all other particulars, send for an "Announcement." Address the secretary, Prof. Chas. M. Gayley, Ann Arbor Mich.

WE are in receipt of a very pleasant letter form Dr. Blackham, President of the American Society of Microscopists. We are at liberty to make the following quotations from it: "As to the Elmira meeting the prospects continue to brighten. A large number of valuable papers have been promised, many of them containing the first announcements of important original investigations. The Local Committee at Elmira are making liberal preparations for the free entertainment of all members of the society who will attend the Elmira meeting. Park church, with its extensive lecture rooms, church parlors, etc., has been placed at the service of the society, and the meetings will probably be held there. A more convienent building as to size, arrangement and location could hardly have been constructed to order. At a recent meeting of the executive committee, sub-committees were appointed to report on the Revision of the Constitution and on the advisability of establishing a quarterly journal as the organ of the Society."

Our readers are quite generally familiar with our ideas as to the advisability of establishing such a journal as Dr. Blackham mentions. They will refer to the February number of this journal for more minute details. Of course we should count the cost before we attempt to build our house; yet if the suggestions we have already given be carried out, or some plan that will give the same results, then the enterprise cannot help but succeed.

The published report of the treasurer,—see page 97, Proceedings American Society, Columbus Meeting—shows a cash balance on hand of $385.81 with a possible available balance (dues then unpaid) of $574.56.

Suppose some of this money had to be used to keep up a Quarterly, how could it be expended to a better profit? We ask this sub-committee the following questions:

First. Are you not of one opinion that a quarterly journal should be established as an organ of the American Society.

Second. Have you anything to fear, financially, with a cash balance on hand of five hundred dollars?

Third. Can you lack for ability with such names to aid you as: Blackham, Curtis, Up de Graff, Kellicott, Fell, and scores of others?

Fourth. With everything in your favor, with nothing to fear, why should you hesitate to demonstrate the assured success?

WE present to our readers again a subject of no small moment to us all. Shall we make it necessary for one or two men to do all the talking at Elmira next August, or shall we put in for our share?

Now, there are a number of live, active societies throughout the country, that have had presented before them during the year work of no small merit. Let such societies as have been thus favored present an outline of the valuable work given before them at the American Association. If this would be generally carried out it would give us a more correct idea of "Microscopy in America" than would be possible to obtain from only two or three individual papers.

We have a very earnest and competent man as president to lead us on. Let no one fall asleep. It is a dangerous habit. Remember that the least show of spirit and activity from each of us will in the aggregate make a lively and interesting meeting. To give a hungry man your sympathy is not half so acceptable as a cold biscuit. The "American Association" wants more than your good-will; it wants the hearty co-operation of every person who either owns a microscope or ever expects to own one.

Dr. Up de Graff promises to entertain every member of the association who visits his city next August, or promises to provide entertainment for them—which is it?

IN answer to a number of inquiries we wish to state that the second edition of our "Manual of Histology" differs from the first in that a number of typographical errors have been corrected and a few slight errors in the text removed. The first edition was exhausted much sooner than we anticipated; we only ask that this edition may be served as well.

WE are in constant receipt of letters asking for this and that back number of THE MICROSCOPE. Of course those asking are willing to pay, but we can supply no more.

All of our back numbers form parts of complete sets and to take out one number is to destroy a complete volume. We have a number of sets of volume 1 which will be sent to any address upon receipt of the subscription price. All subscriptions must commence with the beginning of the volume.

WE present our readers with a fine lithograph of uric acid crystals. The crystals were drawn by Mrs. Stowell from the actual specimens, and engraved by the Detroit Lithographic Co. It forms one of the four plates of uric acid which will appear in our new work, "Microscopical Diagnosis." Mrs. Stowell has drawn over thirty figures of the urinary deposits, all from specimens prepared especially for her by a specialist employed in teaching this branch for twenty years. As original figures, we do not hesitate to declare them to be the best executed and most natural in appearance of any in existence.

"Microscopical Diagnosis" will contain also a large part of the original work that Mrs. Stowell has completed during the past three years. This portion is beautifully illustrated with the finest wook-cuts. Part 1, of the work, is occupied by a thorough description of the microscope and methods of work, together with several chapters treating of all microscopical facts appertaining to medical diagnosis.

Arrangements have just been completed with Mr. Walmsley, and his valuable articles on mounting, which our readers have enjoyed, will appear in Part 3 of this work; the concluding chapters of this subject will be given there also. The book is a large 8vo and will contain possibly 300 pages. Especial terms are offered to old and new subscribers. See our advertising page. The book will be ready for the market by the 1st of June.

WE are in receipt of an announcement from Jas. W. Queen & Co., calling our attention to some recent additions to their stock. Their "college microscope" is furnished with two eye pieces, two objectives, condenser on stand, and mahogany case for $45.00. They also offer the celebrated objectives of Zeiss. We notice the receipt of a new lot of Prof. Abbe's test plates, for testing objectives in regard to spherical and chromatic aberration, $2.50.

We have been familiar with the goods of this firm for a number of years, and we are glad to be able to ask you to look on advertising page 1 and then send for one of their catalogues.

MR. BREARLEY, of Detroit, has given us some slips of paper, upon each of which is printed a synopsis of one of the Diatomaceæ. Each Diatom is illustrated and a brief description given

of its discovery, location, interesting features, how distinguished, how examined, and where it can be obtained. More about this we are unable to say at present. It certainly is a very handy and unique arrangement. We wish Mr. C. M. Vorce, of Cleveland, Ohio, the author, would tell us of his plans.

WE have recently purchased for a friend one of Bulloch's Biological Microscopes, complete, as advertised on page 3, and it is enough to say about it what the purchaser said: "Mr. Bulloch did not half represent his microscope to me. I am most happily disappointed with it."

OUR printer, Geo. S. Davis, of Detroit, announces the early appearance of "Lewin on Drugs," translated with the author's approval from his latest German edition.

BY turning to our "Society Proceedings" it will be noticed that the "Camden Society" had some photographing done at their last meeting. A print of the probosis of a blow-fly is before us, taken on Carbutt's B plate; 1 inch objective; A eye-piece; student's lamp and condenser; six minutes' exposure. Certainly very well done.

DO you wish to take an "old reliable" road along the "fishing line," to a place where the streams and lakes are so full of trout, bass and pickerel that they crowd each other out of the water? Then read advertising page 16 and send for a "Tourists' Guide"—page 17. You will get a very readable and nicely illustrated little book all for the asking. Safety, speed, elegance, health, game and books all given away.

Selections.

On a Convenient Method of Imbedding.—The following method of imbedding was worked out by Dr. Justus Gaule, of the Physiological Institute, Leipzig, Saxony, by whom it was communicated to the writer. I have tried it on all sorts of tissue and can fully recommend it.

A piece of tissue of convenient size is to be taken, treated with the ordinary re-agents and stained in the mass. If large, it may be convenient to remove it from the staining fluid to alcohol for a few hours and then replace it. When thoroughly stained, the specimen is to be put in seventy per cent. alcohol for about twelve hours, then transfer to absolute alcohol until it is completely dehydrated. Then put it in oil of cloves over night, or leave it there until it is convenient to imbed it.

Place it in turpentine half an hour,—large specimens for a longer time—then transfer it to a mixture of turpentine and paraffine, kept melted on a water-bath at about 40° C. In this the specimen, if from liver or intestine, etc., should remain for an hour or more; small nerves and blood-vessels of course need not remain so long. Then transfer it to a bath of pure paraffine, melted at a temperature of 60° C, and leave it for the same length of time. Indeed, if care be taken that the temperature does not materially exceed 60°, the specimen may remain as long as convenient. When the tissue is thoroughly saturated with melted paraffine, a small paper box may be filled with melted paraffine and the specimen placed in it to cool. If properly imbedded, a cut surface has a smooth and shining appearance. No line of division must appear between the specimen and surrounding paraffine. The whole mass should cut, as nearly as possible, like one homogeneous mass of paraffine.

The subsequent handling of the sections varies with their nature. Moderately thick sections of firm tissue may be placed in turpentine to remove the paraffine and mounted as usual in chloroform-balsam. Thin specimens, or those which come to pieces when the paraffine is removed, like thin sections of liver, etc., may be laid on the slide on which they are to be mounted and the paraffine washed out by benzine, carefully applied with a dropping-tube; allow the benzine to evaporate, then lay on the cover-glass and ap-

ply thin chloroform-balsam at the edge of the cover. For exceedingly delicate specimens, such as embryos or osmic acid nerves, another method may be used. Lay the section on the slide, wet with absolute alcohol, let it completely evaporate, leaving the specimen attached to the slide; carefully heat until the paraffine is softened, or slightly melted. When cool, let a few drops of benzine—best applied with a brush—run over a section until most of the paraffine is gone. When dry, apply the cover-glass and put a thin solution of Canada-balsam in xylol to its edge. The xylol may be used instead of benzine but it is more expensive.

This method is very convenient, especially for histological laboratories. The specimen once imbedded, can be kept for years, and new sections cut as wanted. No change takes place in it nor can it dry up. It is suited to all tissues. I have imbedded all vertebrated soft tissues, chick and trout-embryos, hydras, snails, angle worms, clams, star-fishes, etc., with equal success in every case.

The ease with which the sections can be made, fully compensates for the time required to embed. The merest tyro, provided with a good section-cutter, a brush to keep the sections from rolling, and such a specimen, must be a bungler indeed if he cannot cut at least thirty even sections from each millimetre of a moderate-sized specimen such as the œsophagus of a rabbit. With a little practice he should be able to cut a millimetre into one hundred sections without losing more than two. The writer has cut a frog's spinal cord so imbedded into 926 sections $\frac{1}{50}$ mm. thick in one day, and mounted them without losing any sections. No one who practices with these specimens will regard this as much of a feat. It is simply a hard day's work.

Specimens as large as the central hemisphere of a rabbit can be stained and imbedded whole.

I append my notes on the spinal cord of a frog, showing the times used in the various processes:—

Cord put into 3 per cent. nitric acid, two hours.
Seventy per cent. alcohol, six hours.
Stained in hæmatoxylin, four hours.
Seventy per cent. alcohol, over night.
Ninety-five per cent. alcohol, twenty-four hours.

Oil of cloves, twenty-four hours (did not wish to imbed till next day); then,

Turpentine stir half-an-hour.

Turpentine and paraffine, one hour.

Paraffine, one hour.

It should be remembered that these cords imbed easily.

One caution further—select paraffine if possible, which is bluish-transparent and which rings slightly when struck. The white, opaque sort is by no means as good. Any addition of paraffine-oil, turpentine, etc., to soften the paraffine, renders it granular and brittle, and is decidedly injurious in its cutting qualities.—E. A. Birgs, in *American Monthly Microscopical Journal.*

RABIES.—This obscure subject has been now approached by the famous experimenter on germ-diseases, L. Pasteur, in conjunction with Messrs. Chamberland, Roux, and Thuillier. The view long supported by Dr. Duboué, that the central nervous system, and above all the medulla oblongata connecting the spinal cord with the cerebrum and cerebellum, is the seat of the development of the disease, had been disputed by Prof. V. Galtier, who found indications of virus only in the lingual glands and on the mucous membrane of the mouth and pharynx, and not in the above-named parts of dogs affected with the disease. Pasteur and his companions have, however, often successfully inoculated the medulla oblongata, the cerebro-spinal fluid, and the frontal portion of one of the hemispheres. The period of incubation before manifestation of its effects has hitherto been found to be uncertain, and often long, but this period can now be diminished by inoculating the surface of the brain directly with pure brain substance removed from a mad dog: in this case, the symptoms of madness, either under its silent or furious form, appear within a fortnight of the operation, and death ensues in less than three weeks from the same date. This method has never—as in so many other cases—failed in producing the disease.

The results of some experiments with the active elements of rabies have led Prof. Galtier to some important conclusions. Six sheep and four rabbits inoculated at different times with this poison

by hypodermic injection all died from its effects; while out of nine sheep and one goat inoculated by intravenous injection none succumbed, but on the contrary, all successfully resisted the effect of subsequent inoculations. Of five rabbits which received as a draught some saliva infected with virus and mixed with water, only two died. The conclusions deducted are:—(1) Intravenous injection of the poison of rabies into sheep does not produce the disease, but seems to confer immunity against it; (2) introduction of the poison into the digestive organs is fraught with danger. Galtier has reasons for suspecting that intravenous injection, practiced the day following a bite or inoculation, or even the next day, will prove effectual in warding off the malady.—*Comptes Rendus.*

INVERSIONAL PHILOSOPHY.

A philosopher sat in his easy chair,
Looking as grave as Milton;
He wore a solemn, mysterious air
As he Canada balsam spit on
A strip of glass, as a slide, to prepare
For a mite taken out of his Stilton.

He took his microscope out of case,
And settled the focus rightly;
The light, thrown back from the mirror's face,
Came glimmering upwardly brightly;
He put the slide with the mite in place,
And fixed on the cover tightly.

He turned the instrument up and down,
Till, getting a proper sight, he
Exclaimed, as he gazed with a puzzled frown,
"Good gracious!" and "Highty tighty!
The sight is enough to alarm the town;
A mite is a monster mighty!"

From t'other end of the tube, the mite
Regarded our scientific.
To its naked eye, as you will guess, the sight
Of man was most terrific;
But reversing the microscope made him quite
The opposite of magnific.

"One sees the truth through this tube so tall,"
Said the mite as he squinted through it;
"Man is not so wonderously big after all,
If the mite world only knew it."

MORAL.

Whether a thing is large or small,
Depends on the way you view it.
—*Chadbourne's Scientific Annul.*

A New Blood-Corpuscle.—According to Bizzozero, if the circulating blood in the small vessels of the mesentery of chloralized rabbits or guinea-pigs is observed under a high power, there will be seen besides the ordinary red and white cells, a third form of corpuscle, which is colorless, round or oval, and from one-half to one-third the size of the red corpuscle. Bizzozero says that it is owing (1) to their want of color and translucency, that they have hitherto escaped the notice of observers. (2) They are less numerous than the red and less visible than the white corpuscle. (3) Owing to the great difficulty of observing the circulating blood in the small vessels of the warm-blooded animals. They can be seen also in freshly-drawn blood, for the most part aggregated around the white corpuscles, or immediately under the cover-glass to which they adhere. They soon become granular, and give rise to what is called the granule masses. Through appropriate reagents, their form can be preserved. A solution of salt colored with methyl-violet has this property. The best method of examining them in the human subject, is to place a drop of the above colored solution over the puncture and mixing the drop of blood thoroughly with it. Owing to their typical forms, it is very unlikely they are derived from the red corpuscles.

The colorless corpuscles contain no ingredients from which they could be derived. After bleeding, and in many diseased conditions, they are increased in number. They play an important part in the formation of thrombi and the coagulation of the blood. They form the principal part of white clots in mammalia. It is probable that they play the *role* in the coagulation of the blood which has heen attributed by Mantegazza and Schmidt to the white corpuscles, because the latter are few in number in the circulating

blood, and their destruction was never observed by Bizzozero, provided the blood was mixed with a saline solution. Again, the time at which coagulation sets in, corresponds very closely to the time that these new corpuscles undergo degeneration. The fluids which retard or prevent coagulation—as, solutions of carbonate of soda and sulphate of magnesia—have the same action in preventing the granular degeneration of these corpuscles. The indifferent solution of salt does not preserve them, but one to which the methyl-violet has been added does.

From this evidence it appears as highly probable that the formation of fibrine takes place, under the direct influence of these corpuscles. To them Bizzozero gives the name of "Blutplattchen." —*Cincinnati Medical News.*

Resistance of Seeds to Extreme Cold.—E. Wartmann has exposed fresh gathered Spanish chestnuts for nearly two hours to a cold of at least 110°, derived from a mixture of sulphuric ether and solid carbonic acid, each seed being carefully wrapped in thin tin-foil, so as to prevent the surface coming in contact with the ether. The chestnuts were then planted in the soil; they germinated and developed in every respect as successfully as those which had not been exposed to the cold. The power of resistance to extreme cold appears, indeed, to be a very general property of seeds.—*Arch. Sci. Phys. et Nat.*

Tracings on Glass for the Lantern. — The following method, by Mr. George Smith, appears to be satisfactory: A piece of finely ground glass is rubbed over with a trace of glycerine, in order to make it as transparent as possible. It is now easy to write or draw on the prepared surface with a hard and finely pointed black lead pencil, and the glass is so transparent that the finest details of any engraving over which it may be placed can be seen quite distincily. The drawing having been finished, the plate is washed with water, in order to remove the glycerine, aud dried. A thin coat of Canada balsam or of negative varnish now serves to render the slide permanently transparent and ready for the lantern. —*Scientific American.*

Items.

MALTINE AS A CONSTRUCTIVE.—"Maltine in its different forms is the only malt preparation I now employ, being so palatable, digestible and easily assimilated. Of its efficiency in appropriate cases there is no more doubt in my mind than there is of the curative power of quinine, cod liver oil, the bromides and the iodides. It deserves to stand in the front rank of constructives; and the constructives, by their preventive, corrective and curative-power, are probably the most widely useful therapeutic agents that we possess. —L. P. Yandell, M. D., in *Louisville Medical News*.

METHOD OF PREPARING AND MOUNTING SOFT TISSUES.—The conclusions arrived at with regard to the structure of the nervous centres by means of the successive action of bichromate of potash and nitrate of silver will certainly receive confirmation from this method, which we owe to Professor C. Golgi. It has the double advantage of enabling us to stain the nerve-cells black within a given time, and of turning out preparation which may be kept for a long period in the ordinary mounting media. The pieces of tissue are hardened to the necessary degree in Müller's fluid, or in solutions of bichromate of potash, whose strength is gradually increased from 1 to $2\frac{1}{2}$ per cent. The pieces must not be more than 1 to 2 cm. thick, a large proportion of fluid must be used, and it must be frequently changed. In from 15 to 20 days the pieces are put into corrosive sublimate solution $\frac{1}{4}$ to $\frac{1}{2}$ per cent. in strength. The reaction requires at least 8 or 10 days, and during this time the liquid must be daily renewed. The pieces gradually change color and acquire the appearance of fresh brain-substance. They may be allowed to remain even for a longer time in the solution, which serves at the same time to harden them. Sections which are to be kept must be repeatedly washed, else crystals and other deposits appear upon them and alter the appearance under the microscope. They keep admirably well in glycerine, which is perhaps better for the purpose than Canada balsam and dammar. By this method the ganglion-cells with their processes are acted upon; their nuclei are often left visible; the elementary constituents of the walls of the vessels, and especially the smooth muscular fibres (muscle fibre-

cells), are also brought out. Golgi reports having had good results from the application of this treatment to the cortex of the cerebrum, negative results in the case of the spinal cord, and but slight success with the cerebellum. The author calls the reaction an apparently black one, inasmuch as the elements on which it has taken effect appear white under surface illumination, and black only by transmitted light.—*Royal Microscopical Journal.*

Are there any cases where elastic fibres are found in the sputa of patients other than consumptive? Yes. Such a case has been under my observation lately, in which I was somewhat at a loss to account for the occasional presence of elastic and non-elastic lung fibres, and yet which I deem to be non-tuberculous. Mr. N——, Swede, printer of engravings, 55 years old, short, stout, chest large, muscles well developed, formerly considered a giant in strength while a seafaring man, consulted me for severe hæmorrhages of the lungs, cough, irritation of throat and nose, flabbiness of muscles, weakness, etc. A careful physical exploration of the case revealed the signs of an hypertrophied heart approaching, if not, fatty degeneration; ulceration on right side of vomer—post pharyngeal wall, small tumor on epiglottis tip; some crepitant râles, not very distinct, over both lungs, but no marked signs of lung necrosis. The blood had the morphology of syphilitic blood, but not the morphology of consumptive blood, etc.—Abstract from Dr. Cutler's article in *American Journal of Microscopy.*

Septicæmia.—In septicæmia the blood is rarely found to contain bacteria, as a rule, only near the wound, from which the disease takes its origin. Vogt met with crowds of ball bacteria in blood taken from the skin of a pyæmic patient, near the point at which amputation had been performed, as also in pus from a metastatic abscess in the wrist, while very few were discovered in blood taken from other parts of the same patient. The pathological alterations found in animals killed by inoculation with septicæmic blood closely resemble those of septicæmia in man, since they are developed in the form of peritonitis, pleuritis, intumescence of the spleen, pneumonia, renal congestion, jaundice, and hyperæmia of the intestines; but their blood rarely exhibits bacteria; perhaps minute granules of a dubious nature. Finally, all symptoms of septicæmia may be present without the appearance of bacteria in the blood. Wolff saw cases of acute pyæmia and septicæmia in which the blood was free from bacteria, although the pus of the wound contained them and brought about fatal effects when inoculated upon healthy animals.—*Medical Herald.*

Reviews.

THE VAGUS NERVE OF THE DOMESTIC CAT. By T. B. Stowell, A. M., Ph. D., Professor of the Natural Sciences in the State Normal School, at Cortland, N. Y.; Author of "Syllabus of Lectures on Anatomy and Physiology;" Systematic Zöology," "The Beginning;" etc.

This is an exhaustive treatise on the vagus nerve. The paper forming the basis of this work was read before the American Philosophical Society, at Philadelphia. It embodies original research extending over a whole year exclusively devoted to the work. It is well illustrated. Price, $1. Address the author.

THE AMATEUR MICROSCOPIST. By John Brocklesby, A. M., Professor of Mathematics and Natural Philosophy in Trinity College, Hartford. Wm. Wood & Co., New York. Pp. 150. Two hundred and forty-seven illustrations. Price, $1.

The introductory chapter treats of the microscope, mounting, illumination, etc. The following are some of the subjects of the chapters: "Microscopic Fossils," "Animalcules," "Minute Aquatic Animals," "Crystals," "Structure of Wood and Insects." The plates illustrating the sections of wood are beautifully executed, and we doubt if our readers have ever seen them excelled. The work is intended as a popular one; yet the lithographs alone are worth the price of the book to anyone. The structure of the scales of the fishes is finely illustrated. It would be difficult for anyone to look through this book and not desire a microscope.

STUDENT'S MANUAL OF HISTOLOGY. By C. H. Stowell, M. D. Second edition; 1882.

The second edition of this Manual differs from the first, in that a number of typographical errors have been corrected, and some slight inaccuracies in the text removed. A large number of orders already have been received for this edition.

NEW THERAPEUTIC AGENTS. By Willard H. Morse, M. D., Detroit, Mich. Geo. S. Davis. Large 8vo. Pp. 210. Price $1.50.

The author presents the medicines under the order of the diseases to which they are applicable. The titles of his classification, then, are the diseases. Old remedies, as well as new ones, are given; but the chief value of the book lies in the presentation of new therapeutic agents and their uses. The work shows care and labor. It will prove a valuable addition to our knowledge of therapeutics and materia medica.

STANDARD TIME FOR THE UNITED STATES, CANADA AND MEXICO. By the American Society of Engineers. Pp. 40. Illustrated.

MICROSCOPICAL DIAGNOSIS. By the editors of THE MICROSCOPE. Large 8vo. Pp. 300. Geo. S. Davis, publisher.

Illustrated with a large number of finely executed cuts on wood and stone. Over thirty figures of the urinary deposits have been carefully drawn by Mrs. Stowell and lithographed by the Detroit Lithographic Co. Each slide of crystals was prepared for Mrs. Stowell by a person of twenty years' experience in teaching this branch. Arrangements have been completed with Mr. Walmsley so that his very practical articles on mounting will appear in the work. It will contain a complete account of all microscopical facts appertaining to medical diagnosis. The work will be ready for distribution by the first of June. Special prices will be given to all subscribers of THE MICROSCOPE.

CUTTING SECTIONS OF VERY SMALL OBJECTS.—H. Strasser adds from 3 to 4 parts of tallow to the imbedding mixture recommended by Kleinenberg (spermaceti 4 parts, castor oil 1 part), and in order to be able conveniently to arrange very small objects for cutting sections in any required position, he places them in the mass while this is still warm, between plates of mica; the temperature must never exceed 45°C. After cooling the mica plates may be readily separated from the mass, which has the form of a thin sheet, and contains the object; it may be then fixed with heated pins in the desired position upon a block of a substance not easily melted.—*Roy. Mic. Jour.*

VERTICAL ILLUMINATOR FOR EXAMINING HISTOLOGICAL ELEMENTS.—Dr. E. Van Ermengem commends the vertical illuminator for the illumination of such of the histological elements as can be mounted on the cover-glass dry. "Blood corpuscles present an extraordinary appearance, their color a lively red, their relief very appreciable, and the slightest inequalities on their surface clearly visible." Good results had also been obtained in the examination of semen, mucus, pus, and liquids containing bacteria, etc.; also of the minute structure of muscles and nerve fibres.—*Belg. Mic. Soc.*

THE MICROSCOPE

AND ITS RELATION TO

MEDICINE AND PHARMACY.

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CONTENTS.

Original Communications.

THE HISTORY OF THE MICROSCOPE AND ITS ACCESSORIES.

BY J. W. CRUMBAUGH, M. D.

SECOND PAPER.

TWO thousand years elapsed from the time of introduction into Greece of philosophy and the revival of letters in Europe, and with letters the cultivation of science. What had been accomplished during this time I have just stated, and what a meagre morsel it is. The following era, however, was productive of greater things. In 1575 Maurolychus, of Messina, published his great work, DeLunæ et Umbræ—the next one of any description relative to our subject. Contemporaneously, Johannes Baptista Porta, of Naples, flourished. He it was who first constructed a camera obscura, an account of which he published when but fifteen years of age (1560) in his "Majia Naturalis." He tells us of his experiments at showing small figures on a white wall in a dark room by means of drawings

on thin paper held before a hole in a window shutter filled with a lens, and through which the sun's rays could pass. This was the hint on which Kircher, who died 1660, based his theory and structure of a magic lantern, doing by night what Porta could do only in the day time.

How great really is our obligation to Kircher for his magic lantern we can scarcely appreciate, until we reflect upon the great amount of instructive entertainment derived from his invention and its outgrowths by the generations succeeding him.

According to Priestley (Optics, p. 76) the invention of the telescope ante-dated that of the microscope (he here quotes Borellus on the invention of the microscope) by a few years, and that we are indebted for both instruments to Zacharias and Johannes Jansen, of Middleburgh—men thoroughly versed in the philosophy of their time and first-class mechanics. This account by Borellus is well supported by circumstantial evidence that, notwithstanding the claims made by other inventors to the priority, we feel well assured of the justness of the Jansens'. Borellus' account is substantially as follows: About 1590, the Jensens presented to Prince Maurice and Albert, Archduke of Austria, the first microscope they had constructed. Wm. Borellus, in a letter to his brother, Peter, stated that in 1619, during his stay in England as officer under the government, he was shown a microscope by Cornelius Drebell, who said the instrument was the same that was given to the archduke, from whom he had received it, and that it was made by Jansen.

Adams, the younger, in his Essays, dates the invention 1580, giving no authority for said date, but giving the credit to the Jansens.

Baker, in his Microscope Made Easy, gives same parties the credit, but as late as 1620.

As described by Borellus in his work previously referred to, this microscope, brought to England by Drebell, was not what we would now call strictly a microscope. "It consisted of a gilt copper tube six feet long and one inch in diameter, supported by three brass pillars in form of dolphins. These were fixed on an ebony base, on which objects to be viewed were placed."

We find in 1646, Fontana, an Italian, the same who claimed the invention of telescopes, publishes his account of a microscope which he said he made and exhibited in 1618, but he has nothing to support his statement.

The year 1630 brings to our minds the name of one to whom more than all others we are indebted for valuable discoveries in optics. This was the year when Descartes first gave the scientific world the great law, "The amount of refraction is proportional to the line of the angle of incidence."

It was about this time in the Christian era that individuals finding themselves unequal to compete successfully with the many inquiries to which scientific pursuits led them, the philosophers of Italy, under the patronage of Leophold, Grand Duke of Tuscany, formed themselves into the first scientific society on record. This academy was called *Del Cimento.* Three years later (1660) Charles II. of England incorporated a philosophical society at Oxford. In 1666, the Royal Academy at Paris was established. These latter two societies are still in existence and flourishing. The *Del Cimento* lived but a decade. Though I have no statement of proceedings of these academies it is natural to suppose that during a time when the microscope was such novelty in science circles, that it formed a leading topic for discussion and a center of attraction for investigation at these meetings. A copy of the minutes of their meetings in those olden times when they had but the crudest knowledge and materials to aid them, I am sure would cause a blush of shame on the faces of members of our modern societies. Then they worked for results, each and every member; now, the mass of the membership is composed of drones or exhibitors of the result of other men's labors. Cannot we be inoculated with a little of the old time energy?

In 1668, Mr. Oldenburg, Secretary, of the Royal Society, read at their August meeting an account of a microscope as made by an Italian, Eustachio Divini. As described (Adams' Essays) the instrument consisted of an object glass, middle glass or amplifier (which is the firsh account of this accessory I can find) and an eye-piece, made of two plano-convex lenses which touched each other by convex surfaces. By these combinations "the field is made larger, the extremities less curved and the magnifying power greater." The tube of the microscope was as large as a man's leg (this, generally speaking, is rather indefinite, but inasmuch as the describer is an Englishman, we conclude the calibre of the tube was not capillary) and the eye-glasses as broad as the palm of a hand. It had three draw tubes, giving four different lengths and conse-

quently magnifying powers. When closed it was 16 inches long and gave 41 diam.; next length 90 diam.; 3d length 111 diam., and 4th 143 diam. We find nothing to lead us to suppose Divini changed his objectives. The amplifier, arrangement of lenses in eye-piece and the construction allowing of change of eye-pieces as well as the draw tubes, were all novelties.

Same year (1660) Philip Bonnani produced and described two microscopes. The more notable he described as having had three glasses mounted in cylindrical tube placed in horizontal position, behind (below, if vertical) the stage was small tube with convex lens at each end, beyond this was a lamp; the whole stand was capable of various adjustments and regulated by rack and pinions. The small tube was used as a substage condenser. The novelties in this instrument were the motions by rack and pinion and the condenser.

Dr. Hooke produced, a few years later, a microscope in no way superior to the foregoing, but being used by so prominent a man, it certainly deserves mention and description. In the preface to his Micrographia he speaks of it as an instrument 7 feet long, 5 diameters, 4 draws, 3 glasses, objective, amplifier, and ocular (deep).

Hartsocker, in same period, 1674, long after Hooke's invention of same, improved the single microscope by the use of small globules of glass by means of which he made the discovery of spermatozoids. I can find no statement of the size of his lenses. Priestley says (Optics, p. 218), "were it not for the difficulty of applying objects to these magnifyers, the want of light and the small field of distinct vision, they certainly would have been the most perfect of all microscopes." In other words, were it not for their imperfection they would be quite perfect.

Leuwenhoek, however, though not the most ingenious man in this period, was certainly the most unremitting and successful worker. Strange to say he never used a compound microscope, but made all his discoveries during the many years of his life (died aged 91) with the simple microscopes made entire with his own hands. He rejected the compound as being unreliable owing to the uncorrected aberrations. For each object or couple of objects he had a microscope, so that according to his own statement he had hundreds of instruments: "Mihi quidem sunt centum centenque microscopia." (L., vol. 2, p. 290.) Priestley incorrectly says

that L. at his death bequeathed the "greatest part of his microscopes (Optics., p. 219) to the Roy. Soc. This is evidently a mistake, for the number received by the society was but twenty-six. A full description of them we find in Philos. Trans., No. 380, by Martin Folkes, Esq. Another account by Baker, in Phil. Trans., No. 458, in 1740, gives the magnifying power, etc., but there is no drawing with either.

STUDIES WITH MICROMETERS.

BY CHARLES K. WEAD, A.M.

Professor of Physics, University of Michigan.

In view of the increased attention paid during the last few years to the subject of micrometry, the following observations may prove interesting to some readers.

1. A comparison was made between a stage micrometer of Fasoldt's, on which there were five spaces of $\frac{1}{100}$ in., ten of $\frac{1}{200}$, and some finer rulings, and a Rogers' "standard" on which were two sets of rulings, one with 1,000 spaces in 0.4 inch, the other with 1,000 spaces in one centimeter. To use a longer space than could be taken with a microscope in the ordinary way, a microscope magnifying 200 diameters was clamped to the base of a dividing engine, and the ruled plate was carried by the slide of the engine just above the stage of the microscope. The engine has a screw whose pitch is nearly one millimeter, and the divided head was read to thousandths of a revolution, corresponding to microns. Thus we combine the good illumination furnished by a microscope stand, and the opportunity of measuring a considerable distance by the long screw. The greatest distance available on Fasoldt's plate was 0.1 inch. The value of this nominal distance on both plates was then found in terms of the same part of the screw. A spot on an eye-piece micrometer, cemented in the tube, and therefore prevented from moving, served instead of cross-wires as the point to bring the lines to. Of course the plate was leveled so that all lines used were clearly in focus, and the lines were so accurately at right angles to the line of motion that no measurable error could arise here. To make sure that nothing had been displaced during the work, the readings of the screw when the first line was in the

field were always verified. The following series is a fair average. Rogers' plate, column one, gives five successive settings on the first line; column two, settings on the two hundred and fifty-first line, and three, settings on line one:

160.352—	157.805—	160.351+	
.351	.805	.351+	Means.
.352	.805—	.351+	160.3515 turns.
.352	.805—		157.8046 "
.352—	.804+	0.1 inch =	2.547 "

Similar measures on Fasoldt's plate gave 0.1 inch = 2.550 turns, from which it would appear that there is a difference between the two plates of one part in 850. Some days previously less careful measures had given Rogers' 2.545 turns; Fasoldt, 2.550 turns.

The following day these were found:

At apparent upper end of lines	Fasoldt, 2.5467
At apparent lower end of lines	" 2.5456
At transverse line - - - - - - - -	" 2.5471
On the long finding lines - - - - - -	Rogers', 2.5457

It will be noticed that the measures on Fasoldt's plate on different days are not so accordant as on Rogers', because the lines are not quite as perfect.

On the whole, therefore, no difference can be proven between these two micrometers; this result is the more gratifying because of the great errors that existed not long ago in micrometers from the most noted opticians. Only a few years ago the only one to be found at the University was two per cent. in error, and Mr. Rogers has shown by numerous measures that such errors were frequent.

Indeed every microscopist and physicist is indebted to Mr. Rogers for the possibility of procuring micrometers whose errors are less than can be detected by any instruments except the most powerful; he has shown so freely his ruling machines and his standards of length, and in his writings has shown such knowledge of the subject of metrology, at the same time avoiding any claim of *absolute* accuracy in his rulings, which would inevitably be a false claim, that we cannot help believing his work the most accurate that is to be had. No higher praise can be given to rulings (as regards accuracy) than to say they are as good as Rogers' "standard." Americans may well be proud of Rogers' micrometers and Fasoldt's test plates.

2. If a person with a spider line micrometer wished to compare two ruled plates under a high power, he is liable to an error which was entirely avoided by the method used above. The lines will usually be covered with a glass (Fasoldt's are on thin glass which is inverted on the slide), and if the cover-correction on the objective is used, the magnifying power will be changed quite sensibly; so unless the covers are nearly of the same thickness errors will arise that will vitiate the results: similar trouble may of course arise in any measures with a spider line or other eye-piece micrometer, as in measuring blood-corpuscles, etc. Though this point is probably not new, it is not generally noticed by practical workers, and so some measures may be given here.

With a Gundlach $\frac{1}{5}$ the circumference of the correction-collar is divided into 10 parts, tenths of a division being easily estimated; it can be turned through 9.6 divisions, or for convenience say $9^{0}.6$. With this objective and a Powell and Lealand spider-line micrometer (whose screw has a thread of $\frac{1}{50}$ inch.) $\frac{5}{2500}$ inch on a covered Rogers plate equal:

2.925	turns,	collar at	0^{0}.
2.98	"	"	$5^{0}.2$
3.05	"	"	$9^{0}.6$
2.99	"	"	$5^{0}.2$

The correction was made by focussing first on the line and in the usual way, then by turning the collar bringing dust on the cover into focus, and then the line again with the fine motion screw. Other methods might give somewhat different results. These were quite consistent. Of course the same part of the same two lines was always used. The lines could be seen well whatever the adjustment; this was correct only at $5^{0}.2$: evidently by turning it from 0^{0} to $9^{0}.6$ the lenses have been brought so much nearer together as to increase the magnifying power by one-twentyfifth.

A dozen years ago Cross measured the increase of focal length caused by this change, and by his method I find with:

Collar at 0^{0}	$f = 0.198$ inch.	
" $9^{0}.6$	$= 0.1915$ to 1895	"

a shortening of about 1 part in 25: the lens evidently magnifies a very little more than a true $\frac{1}{5}$ would do.

Again, with an uncovered Rogers' plate (and probably with the draw tube at a different point from that previously taken):

$\frac{1}{1000}$ in. equals	1.58 turns,	collar at 0^0
"	1.575 "	" 0^0 Covered with glass .0123 inch thick.
"	1.62 "	" $8^0.2$ "
"	1.59 "	" $4^0.6$ Covered with glass .0058 inch thick.

(As the lines were protected by a ring of varnish the covers did not lie quite flat.) It is evident, then, that the magnifying power is changed quite sensibly by the use of the cover-correction. Hence in accurate work the cover-glass over the micrometer and over the specimen should have the same thickness.

3. It is sometimes convenient to know the thickness of a cover-glass; this may be found quite closely by means of an objective with correction. Taking the covers used above, and having focussed on dust or finger marks on the under side turn the collar till dust on the upper side is in focus; with the thinner glass several trials gave as the reading of the collar $3^0.6$, $3^0.6$, $3^0.75$, etc., working backwards focussing on the top with the collar at $9^0.6$ and then on the lower side by the collar the reading was $6^0.1$ twice, a change of 3.5: mean of 7 trials gave $3^0.56$: similarly with the thicker cover, mean of 5 trials gave $7^0.58$. If we assume the change of the collar to be just proportional to the thickness of the glass, since the thin glass is .0058 inch we should have 3.56: 7.58:: .0058: thickness of thick cover: solving we find it to be .01235 inch—a difference of less than $\frac{1}{1000}$ inch from that found by a Brown and Sharpe's gauge—a quantity scarcely measurable with this gauge. If one has, then, a single cover-glass whose thickness is known, by a simple proportion the thickness of any other one can be found in a moment. For this particular lens the reading of the collar multiplied by 1.6 will give very closely the thickness in thousandths of an inch. Makers might easily furnish for their lenses the constant multiplier to be used as this 1.6 is; or divide the scale so as to indicate directly the thickness in thousandths of an inch.

It may be added that to get the micrometer readings given, the utmost care was needed, for I could find no stand firm enough to resist the unavoidable slight pressure of the finger on the head of the micrometer screw; further, in one well known stand the tube was

shifted to one side or the other according as the fine motion screw was turned up or down. For the use of most of the instruments above named I am indebted to Profs. Stowell and Spalding.

University of Michigan.
Physical Laboratory, June 10, 1882.

THE DIFFERENTIAL STAINING OF NUCLEATED BLOOD CORPUSCLES.

BY ALLEN Y. MOORE, M. D.

IT has been urged against the differential staining of histological structures, that the process may induce an alteration which may be mistaken for the normal condition. That this is, in many cases, true, is beyond question, but the exceptions are far too numerous to justify it as a rule.

For some years past I have used a process for the double staining of nucleated blood corpuscles, which causes no alteration, except of course in color, and as the structure can be seen much better in a semi-transparent than in a more perfectly transparent body, the corpuscles thus stained, offer advantages for study which are not found in those left unstained.

The fluids used for this purpose, are two, which I shall designate as A and B. Their formulas are as follows:

A.

Eosin, 5 grains.
Distilled water, 4 drachms.
Alcohol, 4 drachms.

Dissolve the eosin in the water and add the alcohol.

B.

Methyl analin green, 5 grains.
Distilled water, 1 ounce.

The blood should be spread upon the slide, by placing a drop upon one end and quickly drawing the smooth edge of another slide over it. This, if well done will leave a single layer of corpuscles evenly spread over the central part of the slide.

When the corpuscles on the slide are thoroughly dry, which

will only require a few minutes, the slide should be 'flooded' with stain A.

This should be allowed to remain on for about three minutes, at the end of which time, it may be washed by gently waving back and forth in a glass of clean water. Before it is allowed to dry, the corpuscles should again be flooded, this time with stain B. After two minutes exposure to this fluid, the slide should be washed, as before and set away to dry. When dry, a drop of Canada balsam may be put upon the blood, a cover-glass applied and the whole gently warmed until the balsam spreads out properly. When hard it may be finished the same as is usual with balsam mounts.

If now examined with the microscope, the corpuscles will be found to be well stained with red, while the nuclei and "leucocytes" will be a blueish-green.

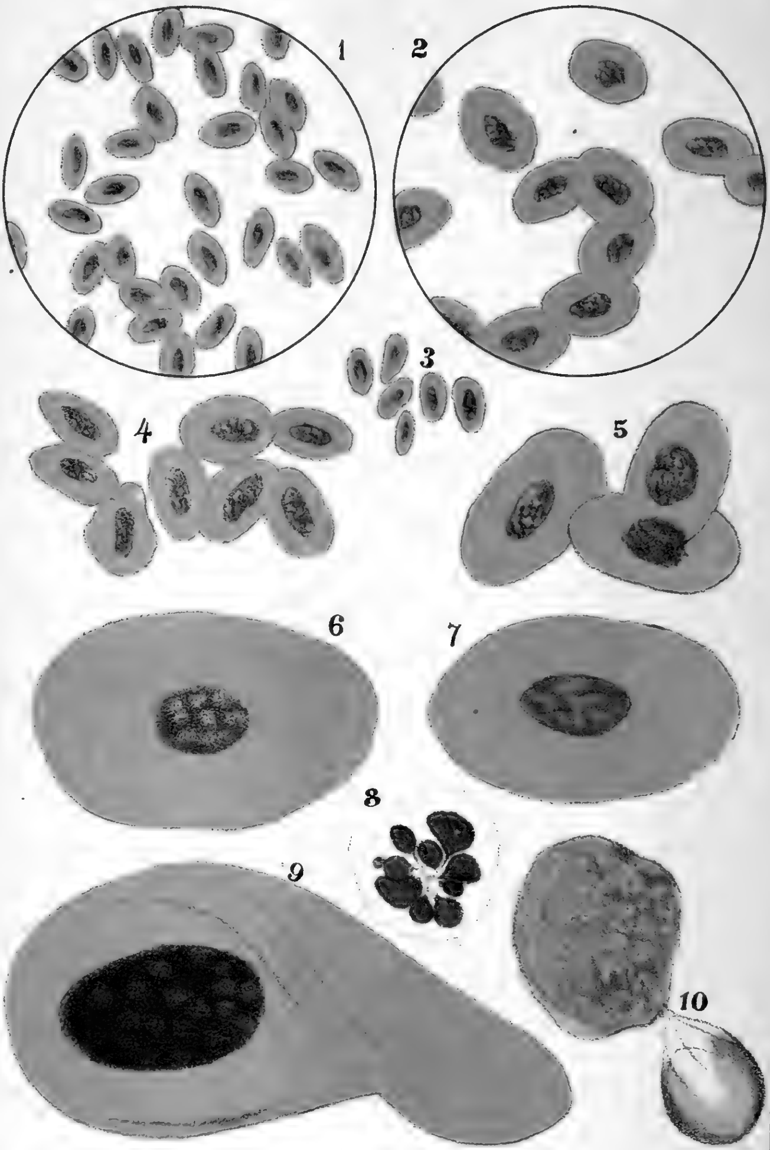
The granular appearance which is ordinarily seen in the nuclei, now shows with a vigor and sharpness which is difficult of description, while the whole corpuscle is as brilliant as a newly cut ruby.

In regard to the structure of the corpuscles, I can say but little. I have never had any difficulty whatever in seeing a distinct granular appearance in the nucleus, provided a first-class objective was used. But so far as a network is concerned, I have completely failed to see anything that could be called such, except when the objective used was improperly adjusted for thickness of cover or immersion fluid. In such cases the dots or granules "appear to run into lines," and a reticular structure may be interpreted. Even by the use of boracic acid I have completely failed to "bring out" the network.

It has been held by some that the corpuscles are covered by, or enclosed within, a "limiting membrane," but those who have endeavored to substantiate their claims—upon either side of the question—have failed as yet.

Figs. 1, 2, 3, 4, 5 and 7, of the plate, show the general character of the double stained corpuscles. Fig. 6 is a red corpuscle from the blood of the snapping turtle, and shows the granular nature of the nucleus very well. The granules in the nuclei of these seem to be larger in proportion to the corpuscles than in any other with which I am acquainted. Fig. 9 is a corpuscle from the newt. This corpuscle also shows the granular nucleus nicely; but the most remarkable thing is the peculiar way in which the corpuscle is

DOUBLE STAINED BLOOD CORPUSCLES



ALLEN Y. MOORE. DEL

EXPLANATION OF PLATE.

DOUBLE STAINED BLOOD CORPUSCLES.

1. Red Blood Corpuscles of Hawk, x 585.
2. Red Blood Corpuscles of Hyla, x 585.
3. Red Blood Corpuscles of Gull, x 500.
4. Red Blood Corpuscles of Dove, x 1060.
5. Red Blood Corpuscles of Frog, x 1060.
6. Red Blood Corpuscles of Snapping Turtle, x 2160.
7. Red Blood Corpuscles of Toad, x 2160.
8. White Blood Corpuscles of Newt., x 740.
9. Red Blood Corpuscles of Newt., x 2160.
10. Red Blood Corpuscles of Newt., x 740.

Figures 1, 2 and 3 were drawn under a $\frac{4}{10}$ inch objective. Figures 4 and 5 under a homogeneous immersion, $\frac{1}{15}$. Figures 6, 7, 8, 9 and 10, under a homogeneous immersion, $\frac{1}{6}$.

folded upon itself. The peculiar folds would lead to the supposition of the existence of a limiting membrane; for, if it were simply a plastic homogeneous mass, it would be natural to suppose that it would coalesce and all wrinkles disappear. Fig. 8 shows a white corpuscle, or "leucocyte," from the blood of the newt. I wish to call attention to the peculiar manner in which some of its nuclei seem to be connected. Fig. 10 shows a red corpuscle of the newt's blood. It was stained by a slightly different process. In this corpuscle a very peculiar condition is seen. In spreading upon the slide, *something* was evidently ruptured, and allowed the nucleus to escape! It also looks as though some of the substance of the corpuscle had run out, and between the nucleus (the blue part) and the corpuscle will be seen a peculiar transparent *something* which is only distinguished by its apparent wrinkles or foldings. Is it possible that this can be the oft-claimed but non-supported membrane?

A MOUNT FOR LOW POWERS.

A BEAUTIFUL slide for low powers may be made of a part section of a human heel, cut from bottom upward. Let the section be about three-eights of an inch deep and not less than one two-hundredth of an inch thick. Place the section in picro-carmine for seven minutes, which will give the skin, muscle and adipose tissue each a different shade. Wash off excess of color, place for a few moments in oil of cloves to clear.

Have a bottle of Dean's gelatine, medium warm, in water bath. The slide, cover and section may also be dropped into the warm water. Place the wet section on the warm slide, apply the gelatine, and cover.

The spiral sweat-ducts in the skin will now show conspicuously.

Mounting in balsam makes the section too transparent to show these ducts well.

A thin section should be mounted in balsam to show the sweat glands and straight portion of the ducts through the muscle, as these do not show well in the thick section, and treatment which serves best to bring out the spiral portion of the ducts.

In ordinary mounting with both benzole balsam and chloroform balsam, I found it difficult to get the balsam to fill out to all parts of cover. Heat will not serve to spread it, as in pure balsam, but a drop of either benzole or chloroform applied to edge of cover will at once bring out the balsam to edge of cover.

R. N. REYNOLDS.

Society Proceedings.

ELMIRA MICROSCOPICAL SOCIETY.

The second annual meeting of the Elmira Microscopical Society was held at the Surgical Institute last evening. The attendance was very large, the late *soiree* having given a popular impetus to the entrancing studies of microcosmic life and structure. Among those elected to membership are Miss S. S. Eddy, and Messrs. Jno. R. Joslyn, Fred. M. Chase, J. Monroe Shoemaker, Joseph J. Emerson, Geo. S. Whitmore, W. C. Stewart, M. D., and J. B. Chandler, of Philadelphia.

The annual report read by the secretary presented a most gratifying state of affairs, financially, socially and scientifically.

Upon motion, Frank G. Hall was instructed to cast one ballot containing the names of S. O. Gleason, D. R. Ford and Thad. S. Up de Graff for president, vice-president and secretary respectively. By the unanimous re-election of these gentlemen to their third term of office, the society has paid its own good judgment the very best compliment.

Mr. Joslyn then delivered off-hand a very happily conceived and wittily worded talk upon the "Germ Theory of Consumption." Upon this topic the speaker "inoculated" quotations from Logan, the stalwart, and from Lucille, the lithe and lissome—anything short of a Jeremiade being germaine to a German germ theory. Some "Jenneral" remarks were also offered concerning vaccination, and the phylloxera was given a "pasteur," so to speak.

This discourse having put the audience into the happiest spirits, Dr. Gleason described a particularly obnoxious and, in this neighborhood as yet, fortunately, rare bug, the *chrysonphalus ficus*. This little creature having been imported in dried fruit from China or Australia, has become indigenous upon the apple and fig trees of California, has already begun its ravages in the oranges of Florida, and was accidentally discovered upon an ivy plant lately purchased in this city by Dr. Gleason, who minutely described it by word and blackboard drawings, as well as on the leaf and under the microscope.

THE AMERICAN SOCIETY.

The society then discussed plans for the suitable entertainment of the American Society of Microscopists, which holds its meeting in this city, commencing August 15th and continuing four days. A committee, consisting of Dr. Gleason, Dr. Up de Graff and F. G. Hall, was appointed by the society to nominate other committees to carry out the wishes of the local society in this matter. The national society will be entertained at the expense of the Elmira society, and the occasion made as pleasant and profitable as possible. It is expected that 150 or 200 delegates, including many of the most learned and scientific men of the United States, will be present. The session will terminate with an excursion or banquet, or both, as may be arranged by the committee appointed.

After inspecting the specimens under the large array of microscopes on duty for that purpose, the society adjourned, to meet at the call of the president.

ELMIRA MICROSCOPICAL SOCIETY.—APPOINTMENT OF COMMITTEES FOR THE NATIONAL CONVENTION.

The following committees have been appointed to make arrangements for the reception and entertainment of the American Society of Microscopists which convenes in this city in August next. All the members of the Elmira Society, whose names are here given, are particularly requested to meet in the dining hall of the Surgical Institute, next Saturday evening, June 3d, at 8 o'clock, to make plans for the proper working of the several committees. Much work has to be done and the time is none too long in which to accomplish the work:

Reception Committee—C. N. Shipman, chairman; James B. Chandler, John R. Joslyn, E. B. Youmans, C. M. Beadle, John C. Greves.

Entertainment Committee—[To provide homes for guests.]—Mrs. J. R. Joslyn, Mrs. S. W. Crane, Miss Clara Spaulding, Miss Anna Stewart, Captain J. R. Reid, Fred M. Chase.

Finance Committee.—Dr. I. O. Gleason, Chairman; F. G. Hall, John Arnot, F. M. Blossom, J. J. H. Barney, Hon. Seymour Dexter.

Excursion Committee—W. W. Eastabrook, chairman; F. E. Fitch, Dr. T. A. Wales, L. T. Holmes, H. B. Berry.

Soiree Committee—L. D. Robinson, chairman; Prof. D. R. Ford, Dr. E. W. Krackowizer, Dr. Thos. Lucy, J. J. Emerson, Geo. S. Whitmore.

Other members of the society will be welcome at the meeting. Come help us make arrangements for receiving the national socity in a becoming manner. By order of the president.

THAD. S. UP DE GRAFF, Secretary.

BUFFALO MICROSCOPIC CLUB.

The regular monthly meeting of the Microscopical Society was held Tuesday, May 9, at the Central School. Among those present were Mr. Henry Mills, Mr. James W. Ward, Mr. F. Scott, Mr. Brewer, Mr. Slocum, Miss Ada M. Kenyon, Dr. and Mrs. Kenyon, Mr. Thomas Crawley, Mr. Harry Lewis, Miss Hall, Dr. W. C. Barrett, Dr. Geo. E. Fell, Dr. A. R. Wright, Dr. Lucien Howe, Dr. F. S. Crego, Dr. A. T. Sherman, Dr. Bull. and a number of others. The President, Mr. Henry Mills, called the society to order, and Dr. Fell acted as Secretary in the absence of Dr. Lee H. Smith.

The name of Dr. Wm. H. Slacer was proposed, and Mr. Thomas Crawley was elected to membership, after which Dr. W. C. Barrett read an interesting paper on the "Broplassus Doctrine," being the result of examinations made upon the structure of blood corpuscles in conjunction with Dr. Fell and Prof. Kellicott. The question at issue was the structure of the red and white blood corpuscle. Dr. Heitzmann, of New York city, claims to have seen certain appearances in the blood corpuscle—"a fibrillated network"—when immersed in a 50 per cent. solution of bi-chromate of potash. Dr. Barrett said he had seen many of these appearances, and gave illustrations of them on the blackboard. He also advanced some new views relative to the granular motion inside the corpuscles.

Dr. George E. Fell, who had worked with Dr. Barrett in these observations, and manipulated the instrument, had not so far seen anything corresponding to a fibrillated structure in the blood corpuscles. He rather claimed that the appearances observed confirmed the prevalent theory of a granular formation to the white blood corpuscles. He gave the method of procedure in the examination of

the blood. The value of the different kinds of illumination as to central and oblique light with regard to observations of this character was shown. While oblique light was really necessary to a satisfactory definition of the *striae* of the diatoms, for the observation of the blood corpuscle more central rays were required. The necessity of using the test objects of the microscope, to be assured of the correct working of the lenses, before satisfactory work could be performed, was commented upon. The powers used in these examinations were from 600 to 2,400 diameters. The objectives used were two of Spencer's 1-6 "duplex" of 118° and 119° balsam angle and a 1-16 inch objective of Gundlach.

Mr. James W. Ward discussed the views presented. He did not coincide with Dr. Heintzman, and stated that even were a fibrillated structure to be found in the blood corpuscle, we would be no nearer the end to be attained, viz., a knowledge of the structure of *protoplasm* than before. A new fact would be simply added to science.

Dr. Barrett presented an interesting subject for consideration. He exhibited a series of slides, prepared by Mr. Miller of Berlin, in which the latter claimed that the *dentinal tubuli* were filled with *bacteria* and *micrococci*—minute animal organisms which caused the decay of the teeth. Dr. Fell and himself had examined the slides and discovered the appearances set forth by Miller, but neither desired to state positively that they were these organisms. The theory heretofore held has been that the decay of teeth was of a chemical nature. If *micrococci* and *bacteria* are founded in the dentinal tubuli it would tend to upset this theory and undoubtedly be a great step in advancing the causes of many abnormal conditions of not only the teeth, but the human body at large.

One of the slides which Dr. Barrett exhibited created a new fact not, he thought, hitherto known to science. A slide made from a sound human tooth showed that the enamel and dentine were both penetrated by numbers of fungi of comparatively large size. Commencing at the periphery these "spross pilz" had pierced the tooth substance diagonally across the enamel rods and the dentinal tubules to a considerable distance. It was not improbable that much of what in tooth caries had heretofore been considered inexplicable, might, in the light of Dr. Miller's observations, be readily accounted for.

Dr. Fell, who represented the Buffalo Club at Elmira June 20th, gave an account of the very successful soiree of the Elmira Microscopical Society. He stated that the people of Elmira were working with great enthusiasm to make the coming meeting of the American Society of Microscopists to be held at Elmira in August next the most successful meeting of the society yet held. He also reported the meeting of the executive committee of the National Society at Elmira August 21st. From the character of the papers already offered, the scientific value of the meeting is certainly assured.

Dr. Lucien Howe read a paper from Max Schultze of Vienna, in which the latter coincided with Mr. Henry Mills and Prof. D. S. Kellicott relative to the structure of the fresh water sponge. Mr. Carter, of England, high authority on the history of the *Spongiadæ* or fresh water sponges, had gracefully backed down and acknowledged his error in certain points of structure relating thereto.

Dr. Barker, who had expected to present the paper of the evening on Histology, owing to lack of time was excused for the time being.

It may be well to mention that the regular meeting of the Microscopic Club is held the second Tuesday evening in each month at the Central school building. Anyone interested in the work of the club is cordially invited to attend the meetings.

LEE H. SMITH, Secretary.

CAMDEN MICROSCOPICAL SOCIETY.

A well-attended, and what proved to be one of the most interesting meetings in the history of the Society, occured at the rooms last night, President A. P. Brown in the chair.

A polite note from the Young Men's Scientific Society, of Chester, invited the Society to their reception on the 16th instant. Accepted.

Mr. Charles Bowden moved that the meetings be dispensed with during July and August. Carried.

Mr. H. S. Fortiner was invited to give the Society an entertainment at the last meeting for the season, 29th instant, and was tendered a note of thanks for past services, as were also the managers of the recent reception.

Dr. George Tayler Robinson, of this city, recently graduating, and a son of Heber Robinson, Esq., was introduced, a synopsis of his remarks upon "Photography in the Eye" following:

The subject was really part of the wonderful properties of that little known compound, visual purple. The doctor, after defining the compound as an organic photo-chemical substance situated in the rods of the retina, described the effect which light has upon it. It was only found in the retina, he stated, during total darkness, and that when brought into the presence of light underwent a change from purple to orange, then became gradually diluted to a yellow color, and finally vanished, leaving the retina of a white color. These changes, he added, had been described by Kuhne respectively as visual purple, visual orange and visual white. The lecturer then gave the process for obtaining the visual purple, and explained by various illustrations how the objects are photographed on the retina. He had been able to imprint upon the retina such objects as rectangular figures, crosses, etc. He then reviewed his numerous experiments which were instituted with the view of ascertaining the functions of the visual purple, and stated that his researches had led him to believe that the compound was a modifier of the intensity of light. He explained how he had found this property of the purple to exist. He cited cases in the lower animals which seemed to indicate that this was the actual function of the compound. He then concluded by showing how the knowledge of this photo-chemical substance might be of value to the medical jurist in determining the character of the surroundings in the case of the death of an individual.

GRIFFITH MICROSCOPICAL CLUB OF DANVILLE, ILL.

The regular monthly meeting of the Griffith Club, of Danville, Ill., was held on Friday evening, May 19, at the residence of the President, the Rev. F. W. Taylor, who occupied the chair.

When the business brought before the Club was finished, the subject for the evening was brought up—"Double Staining of Vegetable Tissues."

Dr. Converse, to whom a paper on that subject had been assigned, failing to appear, the President was called upon for his ex-

perience. After a slight account of a process of staining with aniline green and carmine, which he had lately hit upon, he suggested that practical work was better than words, and that the club might experiment under his direction when the other paper for the evening had been read.

Miss Andros followed with a paper on the "Microscopical Forms Existing in the Waters of Danville," saying that it was not intended as a scientific account, but was of a sketchy nature, merely bringing forward the most conspicuous forms already observed. An enumeration of these forms was made, showing a large variety already found. Cyclops, quadricormes and vorticella nebulifera were especially noticed as among the most pleasing, and some account of their appearance and habits was given. Later, in some specimens exhibited, the club was so fortunate as to be able to watch the binary subdivision of an individual vorticella, the whole process being completed in less than an hour, and the activity of the creature being greatly increased after the division had taken place. The paper was followed by some additional notes from the President on various infusoria and rhizopods observed by him, especially on difflugia pyriformis, with drawings, showing several views.

The club then proceeded to work under the guidance of the President, and succeeded in staining and mounting some fine sections.

The formulæ for the staining fluids used are those published by Geo. E. Davis, in his recently published work, "Practical Microscopy," and in the most successful work the woody parts took a rich carmine, while the cellular tissue took a clear, light yellow green. After working and observing until a late hour, the club adjourned to the third Friday in June.

AT a recent meeting of the Illinois State Microscopical Society some remarks were made by Mr. W. H. Bullock, on a method of measuring the magnifying power of oculars. He stated that Piggott suggested as the easiest and most accurate way of measuring the amplifying power of oculars the plan of placing the eyepiece in the substage and throwing an image of a rule, divided in 1-10, supported at a distance of 10 inches from the

diaphram of the eye-piece upon a stage micrometed, and inspecting the micrometed scale in the ordinary way. He had been at work upon the questions issued by the committee on the subject of the American Society of Microscopists, and had found considerable difficulty in getting the lines of the rule sharply defined. He had, after some experiments, hit upon the plan of using an aperture of definite size, which afforded a well defined image, the size of which could be measured without difficulty. In order to measure fractions of spaces, he cut a narrow slit for a short distance on each side of the rectangular opening, which formed the image, giving a figure something like a cross. The lines of the stage micrometer were sharply defined—while on one side a line could be made coincident with the edge of the aperture, on the other the amount overlapping could, by means of the slit, be easily estimated.

The meeting then adjourned.

E. B. Stuart, per H.,
Secretary pro tem.

At the annual meeting of the State Microscopical Society of Illinois, held at the Academy of Sciences, Chicago, on Friday evening, April 28, 1882, the following officers were chosen for the coming year:

President—Dr. Lester Curtis.
Vice-Presidents—Prof. E. J. Hill and Prof. E. S. Bastin.
Secretary—Wm. Hoskins.
Treasurer—W. H. Summers.
Corresponding Secretary—E. B. Stuart.

A woman who carries around milk in Paris said a naive thing the other day. One of the cooks to whom she brought milk looked into the can, and remarked with surprise: "Why, there is actually nothing there but water!" The woman, having satisfied herself of the truth of the statement, said: "Well, if I didn't forget to put in the milk."—*Medical Advance.*

Correspondence.

Editors of The Microscope:

In the April issue of this journal appeared a short paragraph stating that I had claimed to have resolved *amphipleura pellucida* by central sunlight.

If my letter to Dr. Stowell was so worded, without qualification, it was a mistake on my part, for I intended to convey the idea of having the *mirror* central.

That the light enters the objective very obliquely is easily proved, both by the color of the object and by removing the eye-piece and looking down the body. In fact, it is the light of greater obliquity than 41° in glass (equal to 90° in air, or an aperture of 1^{00} N. A.), that really does the work.

When the light is condensed by the mirror upon the front of the objective, a large amount of it is radiated from the imperfect polish of the front cell. All of this light in excess of 41° from the perpendicular, is totally reflected from the lower surface of the slide. Some of this passes through the object and enters the objective.

I believe Mr. Ed. Bausch was the first to make use of this method of illumination, since which time it has been done by several microscopists and with various objectives. Those with which I have succeeded are the new B. & L. $\frac{1}{6}$ and $\frac{1}{8}$ of 140°, B. A.; Spencer's $\frac{1}{6}$ of 110°, B. A., and $\frac{1}{6}$ of 130 B. A.; and Gundlach's $\frac{1}{16}$ 105° B. A. That there are many others capable of doing the same I have no doubt.

ALLEN Y. MOORE,

53 Prospect Street, Cleveland, Ohio.

ELMIRA, June 10, 1882.

MY DEAR DOCTOR:—Of course you are coming to Elmira to join the assemblage of Microscopists who mean to journey hither on August 15th. We have received intelligence from most of the prominent members of the American Society of Microscopists, stating their determination to be present, and giving title of papers to be presented upon that occasion. We mean to have a good time, and the Elmira Society are making every preparation for the reception and entertainment of their guests. All members of the Amer-

ican Society of Microscopists will be entertained as guests of the Elmira Society, so that no expense will be incurred by you and others visiting us, save your car fare. We have secured Park church, with its large lecture rooms, parlors, library, etc., in which to hold the sessions of the Society. It is in the centre of the city, shaded by the park and convenient of access by street cars. President Blackham's address will be given in the large auditorium, probably on the evening of the first day. On the last day, to-wit, Aug. 18th, an excursion to Watkin's Glen, with dinner at the Mountain House, and a ride up Seneca Lake, will be tendered the American Society by the local one.

President Blackham and Prof. Kellicott both assure me of the certainty of the presentation of a large number of papers on original microscopical investigation. Dr. Holbrook, of New York, who for three years has been silently but industriously searching for the nerves of the liver, will show us what he has found. Mr. Walmsley, of Philadelphia, will teach us microphotography, by means of a simple apparatus. Dr. Carl Seiler has promised to give illustrations in section cutting. Prof. H. L. Smith, Prof. Tuttle, Prof. Kellicott, Dr. Geo. E. Fell, Dr. Blackham, Prof. Albert McCalla and many others have promised papers upon as many themes.

We are determined to make the Elmira meeting a prominent success in every particular. Come see us. You will not regret it, I am sure. Meanwhile, I am

Yours Truly,

THAD. S. UP DE GRAFF.

LETTER FROM PRESIDENT BLACKHAM.

DUNKIRK. N. Y., June 15, 1882.

PROF. STOWELL:

In reply to your request for information as to the doings in Elmira in August next, I can only reply in a somewhat general way. The following papers are expected, but as some of the titles have not yet been officially filed, there may be some changes in the list; but here is the list:

Memoir of the late Chas. A. Spencer—Prof. H. S. Smith, Geneva, N. Y.

Microscopic Organizations in Niagara River—Henry Mills, Esq., Buffalo, N. Y.

The Microscope in Court—Wm. Schuur, Esq., Warren, Pa.

Polyzoa of Local Waters—Prof. D. G. Kellicott, Buffalo, N. Y.

Diatoms of Chemung County, N. Y.—Dr. Thad. S. Up de Graff, Elmira, N. Y.

Report on the Society's Fasoldt Plates and on Micrometry—Prof. F. C. Mendenhall, Columbus, Ohio.

Microphotography by Lamplight—Wm. H. Walmsley, Esq., Philadelphia, Pa.

Terminations of Nerves in the Liver—M. L. Holbrook, M. D., New York City.

A Basis of Natural Classification of Plants Founded upon the Features of Their Seeds—Rev. J. T. Brownell, Pennsylvania.

Papers, illustrations, etc. etc., are also expected from Dr. Geo. E. Fell, Buffalo, N. Y.; Mr. Edward, Bausch, Prof. D. M. Kinsman, Prof. Carl. Seiler, Prof. A. H. Tuttle, Prof. Lester Curtis, Dr. N. G. Byers, W. G. N.; Dr. Ephraim Cutter, John Phin, Esq., Prof. S. H. Gage and others, so that there is a fair prospect of scientific plenty. As to the local arrangements, Dr. Up de Graff, of the local committee, informs me he has written you, so I need not repeat. On this head I will only say that I know the committee well, have tested their hospitality before now, and, like Oliver Twist, am anxious for more; but, unlike poor Oliver, there is no prospect of being sent away dissatisfied. I feel sure that every member of the A. S. M. who goes to Elmira in August will enjoy the meeting, and go home with pleasant recollections of that handsome and hospitable city.

Yours truly,

GEO. E. BLACKHAM.

DRAWING ON GELATINE WITH THE CAMERA LUCIDA.—M. Créteur uses a metallic point for drawing objects with a camera lucida, the drawing being made not on paper, but on a sheet of gelatine laid on a dark ground. The shining point is always visible, and is claimed to provide a remedy for the indistinctness of the point of the pencil, which is the chief difficulty experienced in drawing with the camera by the ordinary method. The drawing can also be readily transferred to stone.

It is questionable whether the advantage gained through the greater distinctness of the drawing-point is not more than counterbalanced by the disadvantage of not being able to draw on paper. As the particular benefit claimed appears to rest upon the shining point, that could be obtained without great difficulty with an ordinary pencil.—*Royal Microscopical Journal.*

[Read before the Northern Medical Association, of Philadelphia.]

AN EYE PROTECTOR FOR USE WITH THE MONOCULAR MICROSCOPE.

BY L. BREWER HALL, M. D., OF PHILADELPHIA.

SO many physicians use the microscope, or are interested in the care of the eyes of those who do so, that I present this evening a little appliance, designed to be used with the monocular instrument, for the purpose of protecting the unemployed eye.

We are all of us more or less familiar with the loss of vision accompanying squint, and the prevention of it by the use of proper spectacles; but do we recognize the fact that the failure to use is the cause of the loss of sight; and do we appreciate that our employment of one and the same eye at the tube of an optical instrument is the same practice that cost the squinting eye of childhood its power of vision?

So many of us are contented when we have trained one eye so as to be able to do acceptable work, that we think we cannot spare the time to discipline the other. If this process ended upon the withdrawal of the head from the instrument, the practice would be less dangerous, but the trained eye finding an unequal companion, performs reading and all other near work with greater ease than its fellow; sees so much more distinctly that the other is left without exercise, except for large objects, and becomes of less and less value as the process goes on.

I could point to those who have practically lost one eye by this process, and I think I am much below the warrant of fact when I estimate that one-half of all those who have used the monocular microscope any considerable amount during five years are monocular men for all fine work. I mean by this that every such person who can "resolve" one of the more difficult "tests" with one eye will find himself unable to do so with the other.

How often have we heard persons exclaim, upon looking into a binocular microscope for the first time, "Oh, how much easier it is to see with this instrument, and how much plainer everything appears," this with one field quite dark (which provokes a smile from an amateur). I am now fully convinced that we cannot ascribe such expressions wholly to dissimulation or flattery, and for the following reasons, viz.:—

When both eyes are left open and one is applied to an instrument, the two images, being unlike, confuse each other in the natural endeavor to blend them. This requires a mental effort to exclude the impression upon the retina of one eye and regard that upon the other only.

Again, when we close one eye by contraction of the orbicular muscle, or by pressure, as by the hand, we cause contraction of the accommodating muscle also, and of the other eye as well.

I have proof of this many times each day, while measuring the eye for spectacles, by means of the ophthalmoscope, but we are all familiar with the spasm in *both* eyes when a particle of dust falls under the lids of *one* only, and we are conscious of the effort, amounting almost to an impossibility before training, of keeping one eye open and the other shut.

Both these are at least factors in the fatigue or irritation that accompanies the use of a monocular instrument, and are strong reasons for employing a binocular one.

There are reasons in favor of a monocular microscope, but we need not stop here to discuss the comparative value of the two forms. It is to overcome these two difficulties and to facilitate the training of both eyes that I propose the use of an eye protector.

A number of these have been devised, among which a plain card, perforated and slipped upon the tube, has, perhaps, been the best; this has to be low down, to be out of the way of the face, and then, to cover the field of vision, becomes so large as to hide the stage, if not interfere with the adjusting screws.

Another consists of a plate extending horizontally from the ocular. In this the edge has to be cut away to admit the nose, and that necessitates the use of the same ocular and the same eye continuously or else demands so much time to remove and replace it that, most operators think it hardly worth the trouble.

The form that I now propose consists of a small, opaque disk near the eye, supported by a wire extending from its *outer* edge downward, to a point on the tube low enough to be out of the way of the nose, then bent upward, parallel to the tube, but not touching it, and attached to a ring near the top.

I made mine of a piece of brass wire, No. 18, about 45 centimeters long; a loop at one end, 4 centimeters in diameter, covered with a piece of black paper folded over and gummed down, forms

the disk. At the other end, I made a ring to fit the draw tube, and then bent the intermediate wire. I attach mine below the flange, on the draw tube, where there is no lacquer to be scratched, but if it should be thought desirable to attach it above the flange, then the ring ought to be covered with chamois, so as not to wear the polish.

The advantages of this form are, the small size of the disk and its support, interfering with the working of the instrument and view of the stage as little as possible. The support is not in the way of the nose; the support is elastic, not uncomfortable when touched by the nose, and striking it does not displace the stand; it can be rotated about the tube and used with either eye alternately; it can be easily adjusted to the eye distance of any worker; and, lastly, it is of so simple a construction that any one can make it for himself, at a very small cost, two or three cents only, in addition to the time.—*Medical and Surgical Reporter.*

New Method of Preparing the Spinal Cord for Microscopic Sections.—Dr. Debove, according to the *Archives de Neurologie*, highly recommends the following method of hardening the spinal cord for microscopic sections, Place the cord in a solution (four-per-cent) of bicarbonate of ammonia for three weeks, then in a solution of phenic gum for three days, and for three days more in alcohol. Sections may then be cut with great facility. They should be placed in water to prevent curling. They are then immersed in a saturated solution of picric acid for twenty-four hours, and colored with carmine for about twenty minutes, the picric acid acting as a mordant.—*Louisville Med. News.*

Editorial Department.

IT is with some degree of pride,as well as pleasure, that we present to our readers, the August number of our journal. Dr. Crumbaugh contributes a second paper on the history of the microscope, which confirms us in the belief we formed as soon as we finished the reading of the first paper, viz: that this is bound to be the very best presentation of the subject.

Prof. Wead, Professor of Physics in the University of Michigan, gives valuable results of no small amount of work in micrometric measurements. The paper shows much labor and care and is very satisfactory in its results.

Then follows an article that has been as much sought after and wondered about as any that has ever come to our knowledge. For two years Prof. Moore has been sending his mounted slides of blood to his numerous friends; and for two years there has been one constant question, how is it done? These slides have gone abroad and have received the highest praise. The slide in our possession at this writing is simply perfect. It forms one of the handsomest preparations in our cabinet case of over 1200 slides. The editors of "THE MICROSCOPE" feel complimented in being the ones selected to present the article to the public. Those at all familiar with the cost of the best lithographic work, must be aware of the expense incurred in producing a plate like the one in our last issue, for which we have received by letter some fine compliments; it is sufficient to state that the present one cost us nearly three times as much. We are very glad that our friends have come to our assistance in sufficient numbers to warrant us in making such outlays. Is it requesting too much of our subscribers to ask them to show this number of the journal to a friend and secure his subscription? Our friends interested in microscopy should become personally interested in our welfare or we cannot become so deeply interested in theirs.

OUR college work for the year is over. Nearly 400 students have taken laboratory work in microscopy under the direct care of the editors of this journal, and about 7000 specimens have been mounted. No student has spent less than 30 hours in the laboratory and a large number 120 hours. Advanced courses in microscopy

for teachers, post graduates, etc., will be offered at the opening of the next college year. One private pupil mounted over 300 specimens while taking this course.

ONE friend writes, "your last number alone was worth the subscription price of a whole year." Another enclosed three dollars for volume II and said he wished to "pay for two years in advance." Another says "I have mounted everything Mr. Walmsley has told us how to mount, and became so deeply interested that I sold my old microscope and bought a fine new one." It is pleasant to be appreciated, doubly so to be told of it.

WE are very happy in the recent possession of a souvenir of old times in the way of a Spencer "Chevalier" microscope. It was one of the first that Mr. Chas. Spencer ever made. We procured it from Dr. C. M. Woodward, of Tecumseh, Mich., and he bought it second handed as a souvenir over 15 years ago. The 1/6 has a remarkable working distance, but of course is sadly deficient in defining power. It will not touch the p. angulatum, but Dr. Woodward says it shows the smallest oxalates and is a very good glass yet for general use.

AN apology is certainly due our readers and Mr. Brearley for an oversight in our last number on the part of some one for which we are responsible. The notice of Mr. Brearley's excursion was not intended to be placed in the reading matter. Mr. Brearley did not ask it to be placed there and we did not intend to have it there, either. Nothing like an advertisement shall ever appear in this journal outside of its proper place.

FOR our October number we have on hand the third paper of Dr. Crumbaugh; an article by Prof. H. J. Rice on The Probosis and Labial Palps of the Oyster; Laboratory Notes by one of the editors. Other articles have been promised.

THE Summer School at Petoskey opens July 13th and continues for five weeks. The editors of this journal have active duties to perform during that time, and it would be impossible for them to

attend to the mailing of the August issue if it were mailed at the usual time. We therefore ask you to accept your August issue at an early date, remembering that the next number will not appear until the first week in October. In that number we expect to give our readers a resume of the meeting in Elmira.

ONE of the finest things in the line of microscopy that has come to our notice is a new weekly edited by Arthur C. Cole, of London, assisted by several eminent specialists. The journal is called "Studies in Microscopical Science." Nos. 1 and 2 of vol. I. are before us. No. 1 describes yellow fibro-cartilage, methods of preparation, bibliography, etc.; No. 2 describes a dicotyledonous stem. These studies will include:

1. Microscopical Biology in all its branches.
2. The Physiological and Pathological Histology of the Body.
3. The essentially modern sciences of Microscopical Palæontology, Mineralogy and Petrology.

Subscribers will be entitled to the following considerations:

Each subscriber will receive every week during the term of his subscription,

1. A microscopical preparation of the highest class and most perfect finish.
2. A printed description of the preparation, in which will be noted:
   a. The literature concerning it,
   b. The habitat, &c.,
   c. The methods employed in its preparation as a means of study,
   d. Its principal features, and any necessary additional remarks,
3. A lithographed or engraved drawing, or diagram, of the preparation, in the execution of which the following details will be most carefully considered and adhered to:
   a. Accuracy,
   b. Finish,
   c. Indication of natural size, &c.

The preparations during the first year will consist of a series of 26 histological, 18 botanical and 8 petrological sections issued alternately.

Twenty-five cents will secure a specimen number of the periodical.

For further particulars apply to the editor, St. Domingo House, Oxford Gardens, Notting Hill, London W., England.

WE have received one or two letters telling us that we are saying too much about the American Society of Microscopists and their meeting at Elmira in August. With all due respect to the authors of the letters, we still propose to say a word in favor of said society. It is through this society largely that we, as Americans, must become known at home and abroad as working microscopists. From this society must come many needed improvements. The committee on eye-pieces is working in this direction. Again not the least thing gained is an opportunity to meet each other and become acquainted with our various methods of work, form lasting friendships, and receive fresh impetus for work.

Such a society should not only yield profit, but also unbounded social pleasure. Dear friends, startle the world, if you wish to, at Elmira in a short paper, and then, having said your say, drop your profundity and have a real good social time.

Dr. Up de Graff knows how to make it pleasant for everybody. The meeting will be called to order August 15th, 10 A. M.

THE following circular has been mailed from Elmira:

Dear Sir: JUNE 10, 1882.

At a meeting of the executive committee of this society, held in Elmira, N. Y., on April 20th, a committee, consisting of E. H. Griffith, Fairport, N. Y.; Dr. Thad. S. Up de Graff, Elmira, N. Y.; Prof. Albert McCalla, Fairfield, Iowa, was appointed and directed to ascertain the views of the members of the American Society of Microscopists upon the desirability of publishing a Quarterly Journal of Microscopy, and to report the result of their deliberations and inquiries to the society at their August meeting.

Therefore, be kind enough to reply to the following queries:

1. Will you support such a journal with your pen and purse?

2. What should be the price of subscription to such a Quarterly, including dues to the association?

Any suggestions you may feel like making with regard to conducting the journal will be received and considered. Please give us your views.

E. H. GRIFFITH,
Chairman.

Please address your reply to
THAD. S. UP DE GRAFF, M. D., Elmira, N. Y.

Reviews.

A Practical Treatise on Materia Medica and Therapeutics By Roberts Bartholow, M. A., M. D., LL. D., Professor of Materia Medica in the Jefferson Medical College of Philadelphia, etc. Fourth edition, revised and enlarged. 8vo.; pp. 662. Price, cloth, $5; sheep, $6. D. Appleton & Co.

This treatise has been received in a very flattering manner during the past six years. The work is to be recommended to the student and practitioner as presenting unusual advantages in its scheme of classification, in the subjects discussed, and more especially in the eminently practical character of the information. The text of the fourth edition has been revised at all points, many articles rewritten and a large number of important additions made. The "index of remedies" is full, and the "clinical index" of twenty-six pages is most conveniently and admirably arranged. The work is so complete that it is a text-book for the close student, and the matter is so arranged that it is the work for the busy practitioner.

A Manual of Organic Materia Medica. A guide to Materia Medica of the vegetable and animal kingdoms. By John M. Maisch, Phar. D., Professor of Materia Medica in the Philadelphia College of Pharmacy. Price, $2.75. 8vo.; pp. 459. Two hundred illustrations. 1882. Henry C. Lea's Son & Co.

The author divides the subject into three parts: Animal drugs, cellular vegetable drugs, drugs without cellular structure. The origin, habitat, description, constituents, properties, and substitutions of each drug is fully given. The organic drugs which resemble one another in physical and structural properties are brought together. The whole work is stamped with Professor Maisch's care and thoroughness, and thus becomes invaluable to the druggist and pharmacist.

A Manual of Sugar Analysis; including the applications in general of analytical methods to the sugar industry. By J. H. Tucker, Ph. D. 8vo.; pp. 353. Illustrated. D. Van Nostrand, 23 Murray Street, New York City. 1881.

We believe this is the only work of the kind in the English language. The German and French have done more in this line, but Americans seem to have been content with a few articles in journals and dictionaries. Dr. Tucker then has done not only a good thing for himself, but also for the chemists of his own country. To them especially will such a work be welcomed and appreciated.

Album Micrographique d'Histologie Générale comprenant l'étude comparée des tissus végétaux et animaux sous le rapport des textures cellulaires. Par L. Créteur. Bruxelles.

Micrographic Album of General Histology, embracing a Comparative Study of Vegetable and Animal Tissues.

The album contains seventy fine lithographic plates, large quarto size. The illustrations include the starches, blood, diatoms,

animal tissue, urinary deposits, etc. The objects are magnified from 500 to 1,000 diameters. It is a valuable contribution to the department of science in which we are working, and it should be in the library of the histologist, whether he works in the animal or vegetable kingdom. We are unable to give the price, but will try and ascertain it and announce the same to our readers. Those interested had better address the editor as given above.

SYNOPSIS OF THE FRESH-WATER RHIZOPODS. By Romeyn Hitchcock, F. R. M. S. 8 vo.; pp. 58. Four full page lithograph plates, Price $1.00. Address the author, 53 Maiden Lane, New York city.

Mr. Hitchcock gives us a condensed account of the genera and species of the fresh water rhizopods, founded on Prof. Leidy's large work, published by the Government. To those unable to obtain Prof. Leidy's work this synopsis will be very acceptable, and to those who have a copy of the large work this will prove a great aid and convenience. It answers the purpose of a key, and with the admirably arranged index and check-list the student can readily keep a record of his work. The four plates illustrate about forty of the more common forms. Mr. Hitchcock has done his work well and it will not fail to give satisfaction.

A TREATISE OF NATURAL PHILOSOPHY: Based on the Experimental Method. By Thos. R. Baker, Ph. D., Professor of Physics in State Normal School at Millersville, Pa. Published by Porter & Coates, Philadelphia, Pa.

We believe that the teachers in our normal and high schools will be well pleased with this work. The subject is presented in a clear, concise and logical manner. A large number of experiments are given in careful detail, and the student is taught the best way to illustrate each subject. We predict a general recognition of the merits of the book.

AID TO THE STUDY OF SKIN DISEASE: With Treatment, Classification and Notes on Diet and Hygiene. By L. Duncan Bulkley, M. D. 12 mo.; pp. 148; illustrated. Presley Blakiston, Philadelphia, Pa.

The author succeeds in presenting the subject in such a popular way that diseases of the skin may be either avoided or recogized and proper aid sought in time. It serves as a guide for the preservation of the health of the skin and as a popular dictionary in dermatology. It is extensively used in the Jefferson Medical College of Philadelphia, and is considered very convenient. A valuable addition to our health primers; better than a good many we have seen claiming much more.

JOURNAL OF THE ROYAL MICROSCOPICAL SOCIETY, June, 1882.

Full of information from the first to the last page. We cannot understand why more of our microscopical friends do not subscribe for it. Address, Editor Royal Microscopical Journal, Kings College, Strand, W. C., London, Eng.

JOURNAL DE MICROGRAPHIE: Dr. J. Pelletan. 176, Boulevard Saint-Germain, Paris, France.

This is a microscopical monthly we are always glad to greet.

THE MICROSCOPE

AND ITS RELATION TO

MEDICINE AND PHARMACY.

VOL. II. WHOLE NO. 10 | Ann Arbor, October, 1882. | No. 4

CONTENTS.

Original Communications.

THE AMERICAN SOCIETY OF MICROSCOPISTS, CONTAINING THE PRESIDENT'S ADDRESS IN FULL.

BY T. B. STOWELL, A. M., PH. D.

DEAR BROTHER:—I promised to send to you a report of the Elmira meeting, and enclosed you will find what you desire. I kept a full report of all the proceedings until I found that Dr. Krackowizer was doing the same thing for the Elmira city papers. Then I simply took advantage of this fact, and the enclosed report is largely due to his labor and skill. Personally, I was very sorry that both of you could not be with me, and a large number of your friends expressed themselves in the same way.

The society met in the lecture room of the Park church at half-past two, Wednesday, August 16. Dr. Gleason gave the address of welcome in a few words which called forth the heartiest applause. The reply by President Blackham, was a most happy one. The fifth annual meeting of the American Society of Micros-

copists was then declared duly opened. The President at once gave his annual report, in which he reviewed the work of the officers and executive committee. Soon the first disappointment was made public in that "the committee on eye-pieces" would be unable to present a final report. Public acknowledgement was made of the kind liberality of yourself and Mr. Griffith in making the offer of prizes.

The first paper read was by Prof. Kellicott, of Buffalo, and was entitled "Certain Crustaceous Parasites of Freshwater Fishes." The second by Dr. Redding, of Newcastle, Pa., on "The Advantages of Osmic Acid as a Staining and Hardening Medium," was also read by Prof. Kellicott, since Dr. R. was unavoidably absent. This violently poisonous and highly reactive agent seems, as pointed out by Prof. Gage in the discussion of the paper, especially well adapted to killing on the instant and preserving *in statu quo* such organism as it is intended to stain with picro-carmine. It should be preserved in a dark bottle; injected by a glass syringe, and mounted in cellulose.

At the opening of the Thursday morning session, the nominating committee were appointed. This was followed by a few words from Vice-President Curtis on the advantages that would, in his opinion, accrue to the society and tend to popularize its aims in the west, if the next annual meeting were held in Chicago—to the proverbial hospitality of which city, as one of its representative citizens, he extended a free invitation. The papers of the Rev. J. L. Brownell and Prof. A. H. Tuttle were read by title only, as both were prevented from attending by illness. Then followed a paper by Henry Mills, of Buffalo, on "Fresh Water Sponges." In discussing this exceedingly valuable paper Dr. Lucy called attention to the fact that Huxley-Haeckel class the sponges with the Metazoa, not with the Infusoriae, and this because of their embryogenesis. As the best mounting medium balsam was suggested after the specimen's were treatment in carbolic acid.

The remainder of the session was wholly devoted to the consideration of Ernst Gundlach's paper on "Light and Illumination."

THE PRESIDENT'S PUBLIC ADDRESS.

At 8 o'clock in the evening the entire auditorium of the church was filled to repletion, despite the intense heat, by a highly intelli-

gent audience. Dr. Up De Graff as first vice-president, took the chair promptly at that hour and introduced Dr. Blackham, the president, in a few neat and highly complimentary phrases. We give a very full abstract of this interesting paper, the delivery of which consumed over an hour.

Fellow-Members of the American Society of Microscopists and Friends:

The constitution of this society makes it the duty of its president to deliver an address at one of the sessions of each annual meeting; and custom has ruled that while the topic selected for discussion shall be scientific in character, it should at the same time admit of non-technical treatment, with a view to interesting and instructing, if possible, a general audience. Hence, at the very outset I encountered much embarrassment in the selection of a theme which at one and the same time might be worthy of the attention and adapted to the appreciation of so large and intelligent an audience as this. But in the end I concluded to attempt a hasty review of the evolution of the modern microscope.

And so I shall endeavor to trace for you the gradual development, from the crystal spheroids which served our oriental ancestors as jewels and toys—to the splendid instruments of to-day, those magic tubes that have discovered to us treasures richer far than those of Ali Baba's cave; that have, as it were, equipped us with another "sense" capable of revealing the hidden yet visible world, in which we live and move and have our being; that seem to give promise of the day in which may be lifted a corner of the veil separating between the material and immaterial, and which had hidden through the ages from human ken the mystery of "Life." And I shall show you that almost every important step toward the realization of this ideal has been taken in the face of the most discouraging prediction on the part of high scientific "authoity" that such attainment was physically impossible, and hence shall strive to draw therefrom encouragment for the future. Of course neither time nor your patience will permit of my treating this vast subject exhaustively—since its details will fill volumes, indeed do fill libraries. I can but touch upon leading links here and there, and hope that I may be able thus to indicate a sufficient number of these to make the solidity of the evolutionary chain seem real to you.

The microscope in its simplest form is but a convex lens of any transparent medium whose refractive index is greater than that of air. Nature supplies them at every turn—every dew-drop reveals the minute anatomy of the leaf upon which it trembles; and many a bright lad has become oblivious to the parchedness of his tongue, as in reaching after the well filled tumbler his thirst of mind was suddenly quenched by visions of startling beauty within it. A lens of rock crystal taken from the ruins of Norwich was exhibited before the British association at Belfast in 1852; and there is treasured at the museum of the Portici an ancient lens of glass with a focal length of only one-third of an inch. But the earliest employment of the microscope as an instrument of scientific research, though traced back definitely to the latter part of the sixteenth or the beginning of the seventeeenth centuries, cannot now be assigned with any degree of certainty to any one individual or country, even. * * * Zacharias Jansens & Son, of Amsterdam, are said to have manufactured them as early as 1590, and it is believed to have been one of their instruments that Drebbel brought with him to England. It was an imposing affair; a copper tube six feet long containing the lenses; and was mounted upon three brass dolphins which rested upon a base of ebony. * * * * * In 1656 Dr. Robert Hooke, of London, published his famous work entitled "Micrographia Illustrata," in which he describes and illustrates an immense number of objects as seen through the imperfect instruments of his day; and he describes a method of constructing lenses of great magnifying power in the form of tiny globules of glass. He also seems to have been the first to avail himself of the principle of "immersion." * * * * * But the honor of being the first really scientific microscopist should no doubt be accorded to Anthony VanLeuvenhoek, whose numerous highly important discoveries were all made with the most primitive instruments, constructed by himself, consisting (not of spheres or globules) but for the first time of a double convex lens, provided with arrangements for holding the object and regulating its distance from the lens. Of these instruments he appears to have made a great number, using each for one or two objects only, and with infinite labor, skill and patience investigating the new world thus opened to his view; thus discovering and describing many of the larger animalculæ, such as rotifers, vorticellæ, etc. His labors in the field of human

and vegetable histology were also very great and fruitful, including, as they did, investigations into the minute structure of the nerves, the discovery of the capillaries and the like, and when we consider the difficulties under which he labored, we may well stand amazed at the extent and general accuracy of his discoveries. * * * Dr. Robert Hooker, however, was the first to use a compound microscope consisting of a simple objective, a simple eye lens and an intermediate lens, which latter, however, was inserted only to enlarge the field of vision, not to increase its power. An Italian, Eustachio Divino, constructed an instrument whose tube was "as large as a man's leg," and with an eye-piece "as broad as a man's hand," consisting of two plano-convex lenses joined with their convex surfaces, somewhat after the manner of Ramsden's positive eye-piece, used sometimes at the present day for micrometric work. This microscope could be drawn out to four lengths, giving magnifying powers of 41, 90, 111 and 143 diameters respectively. A few years later a compatriot of his, Fillippo Bonani, first made use of rack and pinion for purposes of adjustment, and of a substage condenser for improving the illumination. During the following century improvements were constantly made in the construction and mounting of the "simple" microscopes, the most important, perhaps, being that of Nathaniel Lieberkuehn, of Berlin, who placed his object lens in the center of a highly polished concave speculum, by means of which a strongly concentrated illumination is reflected upon the upper side of the object. This method of illumination, as adapted to the modern "compound" microscopes, is still used with apparent satisfaction by some microscopists of the British school. Sir Isaac Newton was the first to propose a "reflecting" microscope; but little seems to have come either of his or of any of the numerous subsequent designs of this character. Indeed with this instrument the great physicist was singularly unfortunate; for though he suggested monochromatic illumination as a means adapted to the correction of the errors arising from spherical and chromatic abberation, he more than offset this help by the publication of his opinion that chromatic lenses were a physical impossibility. * * * * * * But, as in this instance, so many times since have the dogmatic dicta enunciated by great and justly revered theorists, been proved erroneous by the empyric achievements of practical

opticians. * * * * * Lieberkuehn also constructed the first "solar" microscope for projection of magnified objects upon large screens; and the same was equipped with the movable mirror to admit of its protracted use by a Mr. Cuff, of London, where Lieberkuehn first exhibited his invention. But the high hopes engendered by it were never realized, partly, no doubt, on account of its dependence upon direct sunlight—always an uncertain factor, especially in England—but more particularly because it can only display the shadow of things, instead of the objects themselves. It still survives, however, in a modified and improved form, as the oxy-hydro and electric light projection microscopes which, though valueless for the purposes of original investigation, are of great use for the demonstration of certain classes of objects, to large numbers at one time. * * * * * Baker described also a new invention for fixing the pocket microscope [an instrument strongly resembling the toy grandiloquently advertised and extensively sold some four years ago as the "Craig" microscope] and giving light to it by a speculum, this instrument having been originally intended to be used by holding it up to the light like a field glass. * * * * * A certain Mr. Marshall appears to have constructed the first compound microscope, according to our modern conception of the term, and of this various modifications were made from time to time, among which should be mentioned those of Culpepper and Scarlett, as well as those of the Adamses, father and son; which latter continued the favorite instrument until displaced by the "achromatic," which we owe to the demonstrations of Euler, the great Swiss mathematician, as corrected and seconded by the practical experiments of John Dolland, who showed the corrective power of crown glass refraction over flint glass dispersion. Yet as late as 1821 we find the great French philosopher, Biot, insisting that "opticians regard the construction of a good achromatic microscope as impossible," and at the same time Dr. Wollaston—the highest authority upon this subject then in England—gave it as his opinion "that the compound microscope would never rival the simple one, * * * yet in less than two years thereafter two French opticians, Selignes and Chevalier, produced the *reductio ad absurdum* of all this *a priori* theorizing in the shape of compound achromatic objectives, consisting each of two or more pairs of

lenses, each pair in turn consisting of a double convex glass, and four years later Amica, of Modena, produced an achromatic combination surpassing anything previously constructed in this line; and from that time on the principle of combining two or more lenses so shaped and adjusted as to correct each other's errors was firmly established. * * * * To the discoveries of Joseph Jackson Lester and their practical application by working opticians, like Andrews, Ross and Smith, of London, we owe the production of compound objects of wide aperture, flatness of field, and above all of highly perfected definition. * * * * Then followed in rapid succession improvement upon improvement; the immersion principle was utilized [Amici-Hartnack]; the aberration produced by the cover-glasses corrected [Ross]; the angle of aperture increased to 135 degrees, which for a long time was held to be the largest attainable, etc., etc. Meanwhile, there had grown up, in a little village of this state a young man of a scientific and practical turn of mind who had taken for himself and by himself the study of optics and had even in his boyhood made with his own hands a microscope and some telescopes, and later on had done, though without much encouragement or patronage, good work as a microscopist, too. Reading Ross' paper, and not feeling satisfied with his theoretical reasoning, he soon brought forth practical proof of the correctness of his own instincts by manufacturing a dry one-inch and one-twelfth inch objectives of 146° aperture. This young man was Charles A. Spencer, the father of American microscopy, and, I am glad to say, the first honorary member of this society. Soon after, Professor Bailey, of West Point academy, succeeded in resolving with one of young Spencer's microscopes the markings on a diatom which had resisted the best objectives of foreign make which he had been able to procure. Bailey was of course delighted, and named the little creature Navicula Spencerii. * * * * In the meantime the improvement of the microscopes had been progressing rapidly in other directions also. Thus, the negative eye-piece was adapted from the telescope to our instrument. The "stand" also began to receive much attention, particularly in England, where great pains were taken to make it solid and steady, yet handy and provided with many useful accessories. Indeed, to such an extreme were these efforts carried in some cases that the more costly stands a few years ago, were ponderous

engines, embossed with an array of nuts, screws, handles, etc., truly appalling to the beginner, and unnecessarily perplexing even to the experienced veteran. In 1850 Professor Riddle of New Orleans invented the stereoscopic binocular, which, though much improved since that day, appears still to be open to these objections : loss of light and more or less imperfection of definition. Thus, on the whole, the effect of the invention of the "Binocular" seems to us to have its parallel in that of the "Solar," while increasing the number of interested lay observers, it has proved a stumbling block in the path of the scientific investigator, who desires, above all things, the improvement of the microscope as an instrument of precision. * * * * The lenses which were believed to have so nearly attained the limit of perfection fifteen years ago [resolving Noberts' fifteenth band, *i. e.*, lines 1-91,000th of an inch apart] are antequated now, and the theoretical limit of perfection has thus moved forward and forward like the horizon, and seems destined ever to recede. Thus, Surgeon-General Woodward of the navy has since resolved the entire nineteenth band on the same plate. * * * * Ten years ago Mr. Tolles began the now famous aperture war by the publication of his article on experiments on angular aperture, in the *London Monthly Microscopical Journal*, his advocacy of the wide-angle theory being antagonized by such famous opticians as Messrs. Wenham and John Mayall, Jr.,—and peace was not declared until Mr. T. had constructed and furnished the formulæ of his two and three system balsam immersion objectives with apertures ranging from 100° to 110°—backed by the mathematical demonstrations of Mr. Renel Keith and Dr. Piggott. And four years ago Prof. Stokes, of Cambridge (England), demonstrated mathematically that an aperture of 180° in glass was conceivable—while Zeiss and Powell and Leland, in Europe, as well as Tolles, Spencer, Gundlach and Bausch, in this country, are at this very time constructing homogeneous immersion objectives of 136° to 140° balsam angle. The lesson, then, that I would draw from this glorious history of struggle with and triumph over almost insurmountable obstacles is: the end is not yet; absolute perfection can never be achieved, but may be constantly approached; the horizon of yesterday is the halting place of to-day. The future holds for the coming optician triumphs as brilliant as any of those in the past, and the time will come, nay is perhaps close at hand, when the best microscopes of to-day will be as antiquated as those

of Hooke, Leuwenhoek and Ehrenberg are now. Let it then be the duty of this society to encourage further effort on the part of our microscope makers; to record their successes, and above all to make such use of the products of their genius and skill, that the boundaries of knowledge may be enlarged, new facts discovered and old ones reversed—and if the future student in turning over the pages of our proceedings shall find there recorded the struggles and triumphs of our working microscopists, then this society will not have existed in vain.

Professor McCalla, as secretary of the committee on quarterly journal, then submitted the following report:

The executive committee, having heard and considered the report of its sub-committee, appointed to consider the question of the advisability of establishing a quarterly journal, beg to make the following recommendations:

1. That it is not advisable to establish a separate and independent journal.

2. That for the present no change in the method of publishing the proceedings should be made.

Dr. Mercer then reported the following ticket from the committee on nominations:

OFFICERS.

For President—Prof. Albert McCalla, of Fairfield, Iowa.
First Vice-President—E. H. Griffith, of Fairport, N. Y.
Second Vice-President—George C. Taylor, of Louisiana.
[Secretary Kellicott and Treasurer Fell holding over.]

EXECUTIVE COMMITTEE.

H. F. Atwood, of Rochester, N. Y.; Dr. L. M. Eastman, of Baltimore, Md.; Dr. F. N. Newcomer, of Indianapolis, Ind.

Prof. McCalla and Mr. Griffith returned their thanks for the honor thus conferred upon them, amid hearty applause.

Dr. M. L. Holbrook, of New York city, then read his paper upon "The Terminations of the Nerves in the Liver." As the outcome of three years' patient investigation in this field it came with the force of authority and carried with it full conviction. The doctor states that the nerve fibrils terminate not in the cells, according to Pflueger, but in the walls of the capillaries, according to Nesterowsky, whose discoveries are at every point corroborated

and amplified. From three to five ramifications enter each of the lobules taking their course along the capillaries—whether portal or arterial was not stated. Specimens were prepared from perfectly fresh livers; frozen and cut by the microtome into very thin sections vertically across the arteries and then stained with chloride of gold and formic acid.

This paper gave rise to a prolonged discussion, mainly on a collateral issue, however, that namely, of the striated, or as is claimed,

NET STRUCTURE OF THE RED BLOOD CORPUSCLE.

It gave vent to a volume of protests against the assertions of Heitzman that was well-nigh unanimous; his only supporters being Drs. Barrett and Holbrook—the former by no means assured of the entire validity of the claim; the latter a pupil of Heitzman's, who does not claim to have seen the alleged structure, except under the teacher's direct manipulation. Another pupil, Dr. Stillson, never was able to discover the same during his own experiments, any more than had Messrs. Lucy, Fell, Up de Graff, Johnson, G. G. Taylor, Nott, or Blackham, the latter gentleman's statements being especially convincing as to Heitzman's error. Dr. Mercer, of course, took issue with him, ascribing the "reticulated structure" to the source of error claimed to have been discovered by Abbe. Dr. Deeke had seen the striæ under certain (microscopically) suspicious circumstances, but was inclined to call them abnormal configurations of granular matter. Dr. Bleidle recited the results of Woolrich's experiments under Ludwig, at Leipzig, which tended to establish a strong suspicion of the red corpuscles' organization—of what character remaining, however, undetermined. Dr. Krackowzer while also recalling the teachings of Ludwig, according to which there was a strong *a priori* probability of the corpuscles' reticulated structure—especially in view of the manner of the blood's æration—yet maintained that no such structure had as yet been conclusively demonstrated and challenged the production of evidence that the "red" was a "cell" in the sense of the "white" corpuscle. It was a great time for the doctors, they had two hours all to themselves!

The next meeting will be held in the city of Chicago, August, 1883.

BARLEY, RYE, OAT AND BUCKWHEAT.

BY MRS. L. R. STOWELL, M. S., FROM PART II. OF "MICROSCOPICAL DIAGNOSIS."

BARLEY is found principally in the temperate region. There are four distinct species and from these many old varieties have been cultivated and new varieties are yet being developed. Barley is the most hardy of all the cereals, its limit of cultivation extending farther north than any other, and at the same time it can profitably be cultivated in some of the tropical countries. Pliny claimed that barley was the most ancient food of mankind. No less than three varieties have been found in the lake dwellings of Switzerland, in deposits belonging to the stone period. According to Professor Heer two of the kinds found there are the most common varieties of to-day. The smallest, the most common, and the most ancient known, is the *hordeum hextastichum sanctum.* The Goddess Ceres generally has ears of this variety decorating her hair, while it is also found stamped upon ancient coins.

Barley has formed an important article of food in some of the northern countries, but on account of its deficiency in gluten as compared with wheat, it can never be a popular flour for making bread. It has some redeeming qualities, however, for we are told the Greek athletes were trained on this diet. As to importance both in an agricultural and commercial point of view barley is the grain crop ranking next to wheat. It is cultivated principally for malting purposes, and of all the cereals is the best adapted for this, containing as it does more starch and less gluten, and about 7 per cent. of ready formed grape sugar. Good barley should have a thin, clean, wrinkled husk closely adhering to a full, plump kernel, which when broken appears white and sweet, with a germ full and of a pale yellow color.

The fruit coats of a grain of barley differ considerably from those of wheat. There are four layers of longitudinally arranged cells. The walls of the outer layer are wavy, but not beaded as in wheat. There are three layers of transverse cells and the walls are not wavy. There are also generally three layers of cells containing the gluten or nitrogenous substances. All

of these cells are more delicate than the corresponding ones of wheat. The cells of the central part containing starch are also more delicate, and when empty resemble thin walled fibrous structure.

If we cut open a kernel of barley and scrape a little of the white powder from the center, we will find there are present two kinds of starch grains, both large and small. The large grains are lenticular; when seen on the face they are round or nearly so, but when seen on the edge they are oval, frequently showing a longitudinal furrow. A faint nucleus is present

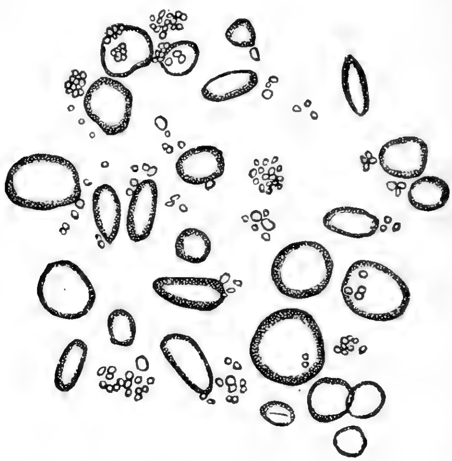


Fig. 1. Barley Starch. X 475. (Drawn with the camera lucida.)

and faint rings are seen in a few of the grains, though not in all of them. The average size is about one sixteen-hundredth of an inch in diameter. The small grains are angular, dark and not collected in masses as in many of the starches. The whole appearance of barley starch is much more delicate than that of wheat. The large grains are smaller, more nearly spherical and more opaque. The small grains are smaller, more uniform in size and fewer in number than the corresponding ones of wheat. These small grains are one seven-thousandth of an inch in diameter, and frequently have a nucleus. There is no cross when viewed with polarized light.

RYE is probably a native of Southeastern Europe and Southwestern Asia. It has been cultivated for ages and is still grown in the most of temperate climes. Rye is frequently used as an adulteration of many of the commercial spices. Roasted rye is frequently found mixed with coffee, and has been reported as one of the ingredients found in wheat flour. Rye is obtained from *Secale cereale* and the kernels resemble wheat only smaller. The cells of the fruit coats are smaller, more delicate and more finely beaded than wheat.

There are two kinds of starch grains, large and small, found in rye. The large grains are quite irregular in their size, some

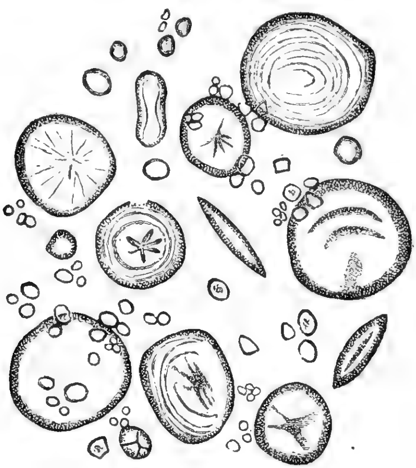


Fig. 2. Rye Starch. X 475. (Drawn with the camera lucida.)

being as small as barley, while many are several times larger than the largest grains of wheat. They are lenticular with a great difference between the two diameters, so when the grains are seen on the edge they are quite slender. The very large grains are flake-like, more transparent, devoid of rings, and frequently have several lines radiating from the central nucleus. Rings are seen in the smaller ones of the large grains, which are more opaque and thicker than the others. The small grains are quite numerous and very small; they are smaller than the corresponding grains of wheat, while the large grains are very much larger. A strongly marked cross is seen with the polarized light in the large grains of rye starch.

OAT was formerly much used as food for man, especially in cool climates, where it is cultivated with the best success. Its native country is not certainly known, though probably Northern Europe or Asia. There are several distinct species of oats, the one generally cultivated in this country is *avena sativa.* Oat flour does not form a dough or paste like wheat flour, so it can never be used as a substitute, although it is frequently mixed with wheat and sold under the name of wheat flour.

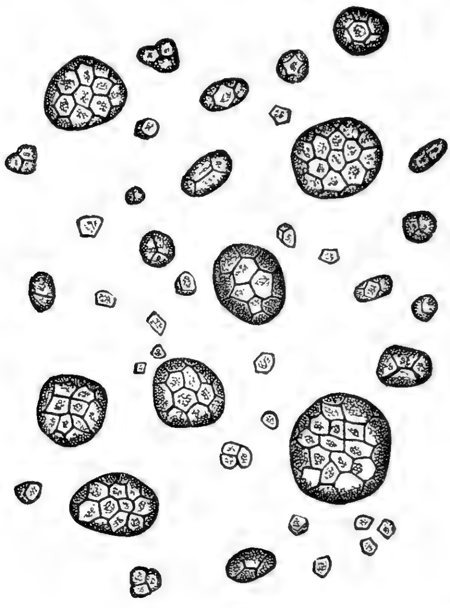


Fig. 3. Oat Starch. X 475. (Drawn with the camera lucida.)

Oat flour, however, contains a large amount of nitrogenous matter. The grains or kernels of oat are usually found in market inclosed in their husks. The first fruit coat of oat is composed of several layers of cells. The cells of the first layer are large, long and bordered with thin beaded walls. From the cells of this outer layer of the first fruit coat, and from any point on its surface, arise long epidermal hairs, always turning toward the apex of the grain, where they are much more numerous.

Oat starch is composed of both compound and simple grains. The compound grains are oval, egg-shaped or spherical, and are composed of from three to twenty grains. The dividing lines between the single grains show quite distinctly. They are from one two-thousandth to one eight-hundredth of an inch in diameter. These compound grains are more opaque than the majority of the starches. These grains are bounded by a smooth, curved surface, thus giving to the simple grains their peculiar shape. Each simple grain has two or more plain faces or sides, while the remainder of the grain is curved. There is no nucleus present, but the most of the simple grains have a slight depression over the surface, so the edges or borders are more prominent than any other part of the grain. The small grains are from one four-thousandth to one five-thousandth of an inch in diameter. There is no cross present when examined with the polarized light.

BUCKWHEAT is a native of Central Asia, but cultivated extensively in Europe and America for its seed. Its scientific name is *Polygonum Fagopyrum L.* The seeds are inclosed in a dark brown tough rind; they are three-sided in form with sharp angles, and are very similar in shape to beech-mast from which fact it derives the German name *Buchweizen* (beech-wheat). In Great Britain it is used only as food for the pheasants and poultry, but in Northern Europe the seeds are used by all classes of people for food. In the Russian army, buckwheat is served out as a part of the soldiers' rations. It is used to some extent throughout the United States for food. Buckwheat is poor in nitrogenous substances and fats as compared with the other cereals. It is a favorite crop for very poor land, as it grows with great ease and rapidity. Buckwheat flour is frequently found mixed with the poor qualities of wheat flour. Its color and properties prevent it ever being substituted for wheat flour.

Buckwheat starch (Fig. 4) is composed of both compound and simple grains. The compound grains or masses are either cylindrical or prismatic. When cylindrical the curving surface is perfectly smooth, but the ends are irregular as though they had been broken. These masses are very numerous and characteristic, unfortunately they closely resemble the cell contents of black

pepper. These compound grains are much larger than those of oat. They are quite opaque and show distinctly the divisions into small, single grains; many of the small grains are like the corresponding ones of oat in having two or more plain sides and the remainder of the grain curved. They are larger than oat, being one three-thousandth to one sixteen-hundredth of an inch in diameter. They are quite irregular in size, and generally a nucleus is present. There are no rings.

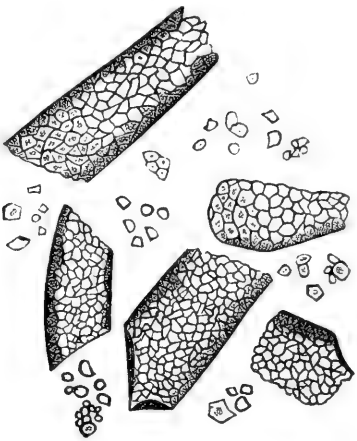


Fig. 4. Buckwheat Starch. X 475. (Drawn with the camera lucida.)

If you suspect the sample of flour which you are examining contains either oat or buckwheat, it will be much easier to examine it first with a low magnifying power (something less than 150 diameters) and decide the question of the compound grains or masses first, then examine it with a higher power. Fortunately for humanity the best qualities of flour are almost invariably what they profess to be, "pure wheat flour." The mixtures and adulterations of other flours and too often mineral substances are found in the cheapest, poorest flour in market.

BEHAVIOR OF THE WHITE CORPUSCLE.

BY R. J. NUNN, M. D., SAVANNAH, GA.

ON the 7th of August, 1882, I was examining the blood of a patient, a robust man in fine health. The blood seemed in excellent condition; the proportions of the elements were all that could be desired. The medical history of the case has nothing to do with this observation and hence is omitted.

In the specimen of blood examined there were a few of those glistening round bodies which are present more or less in all blood that I have examined. The name and functions of these bodies are alike unknown to me and are, I believe, matters of dispute among histologists at present; but whatever end they may fulfill they have been present in the greatest number in the blood of debilitated patients who were for the most part consumptives; still, as before remarked, they have been observed in the healthiest blood.

In the blood in question the white corpuscles were unusually large and active, and one in particular attracted my attention by the rapidity of its movements. I saw it glide toward one of these glistening bodies and surround it, insinuate itself underneath it, and, so to speak, got the body upon its (the corpuscle's) back. Carrying this body along it approached another and executed the same manœuvre, and so with another and another until six of these bodies of different sizes were upon the white corpuscle. Then one after another sank into the interior of the white corpuscle and could be seen in it as dark specks, the shade gradually becoming less deep as if the bodies slowly dissolved away, the smallest first disappearing.

The sixth body did not sink into the corpuscle, but the corpuscle slid from under it and left it resting upon the slide. The corpuscle next retreated a short distance and extending another part of its substance again approached the body and nearly surrounded it. Again the corpuscle retreated and again returning endeavored apparently to surround the body, but unsuccessfully. These movements of apparent attack and retreat were repeated several times, and at last the corpuscle moved off a distance equal to the diameter of six or seven red corpuscles. I thought then the performance was at an end, but no, the corpuscle suddenly stopped and returned again to the body; this time it had so rolled over as to present to the body the exact place through which the largest of the other five

bodies had passed into its interior; it then extended itself out under the body, so as to raise the latter up from the slide. The body now occupied the position of a ball in a cup and began slowly to sink into the corpuscle. Suddenly, however, it slipped out, rolled off of the corpuscle and fell upon the slide with a little rebound. . The white corpuscle now apparently gave up the attack and moved rapidly away.

The whole time of observation was about three and a half hours. The instrument was a one-quarter inch objective (Tolles), a one inch eye-piece and an amplifier in the tube.

I do not desire to theorize nor draw inferences on this behavior of the white corpuscle, but simply record the facts as I saw them.

BACTERIA.

Bacteria, whether significant of disease or decline of health, are found more or less numerous in everything we eat and drink. The germs or spores of many kinds known as *termo*, *lineola*, tenue, spirillum, vibriones, etc., exist in almost infinite numbers, some of the smallest are too small to be seen by the highest powers, which being lodged in all vegetable and animal substances, spring into life and develop very rapidly under favorable circumstances. They develop most rapidly when decomposition commences, and seem to indicate the degree or activity of that decomposition, also hastening the same. They are found most numerous in the fæces and usually fully developed in the fresh evacuations of persons of all ages. They may be seen plainly under a thin glass with high powers with strong or clear light when the material is much diluted with water.

These bacteria appear almost as numerously, yet more slowly in urine, either upon exposure to air or when freshly evacuated when the general health of the individual is declining or any tendency to decomposition. A diagnosis can be aided very greatly by a study of these bacteria, as they indicate or determine the vitality, vigor and purity of the system, whether more or less subject to disease, even before any signs of disease appear. They seem to pre-indicate the hold of the life force on the material and always appear when that force is broken. Their relative quantity found in fæces is as a

barometric-indication of the general health or some particular disturbance, and it is surprising how very fast they multiply while simply passing the intestines under circumstances favorable for their growth. These forms, so small, are important, because so very numerous, and their study has been perhaps avoided by many, yet they certainly mean something and effect something, even the non-malignant varieties as mentioned above, and it is certainly worth while to continue to study their meaning, even beyond what has already been written by others on the subject.

J. M. ADAMS.

WATERTOWN, N. Y.

THE HISTORY OF THE MICROSCOPE AND ITS ACCESSORIES.

BY J. W. CRUMBAUGH, M. D.

THIRD PAPER.

IN Dr. Henry Baker's microscopic essays (1753, London), we find the first representation of them, and, so far as we know, reproduced but once, and that by Queckett, in his popular article on this subject. (To ED —For diagram, see Queckett's work.)

The following is a description of the diagram: The flat part, A, is composed of two silver plates, finely finished and rivetted together at *b-b*, *b-b*, *b-b*. Between these, at *c*, there is set a small bi-convex lens in a socket, with perforation of plates for eye and light. Limb of silver at *d* is fastened to the plates by screw *e*, which goes through both. Another part of this limb joined to it at right angles passes under. The plate comes out on the other side. Through this runs directly up a long, fine thread-screw, *g*, which raises or lowers the stage, *h*, whereon a coarse, rugged pin, *i*, for the object to be fastened to, is turned about by a little handle, *k*. The stage and pin are moved to and from the line by the little screw, *l*.

All parts were made of silver, highly polished. The lenses were good, and those given to the Roy. Soc. of powers varying from 40 to 160. His success was not due so much to the exceeding excellence of his glasses as to his superior judgment. It is very evident, from some of his discoveries, that he must have had lenses

of far greater magnifying power than those at present remaining. He was well acquainted with the method of viewing opaque objects, which some years later (1740) was reproduced by Lieberkuhn. Several authors make the mistake in stating that the magnifiers used by him were globules of glass. Dr. Baker, to whom they were referred for reports, distinctly asserts they were bi-convex lenses. L., in letter to Roy. Soc., says that, from forty years' experience, he prefers "microscopes of medium power, but of greatest degree of perfection, as they are to be trusted."

In 1665 Dr. Hooke published his *Micrographia*, and to him, in 1668, we are indebted for the substitution of glass globes for lenses. He made lenses $\frac{1}{50}$ diam. and polished them himself. To him, too, we can trace the theory of the solar microscope, afterwards described by Prof. Belthasaurs in Erlange, 1710. Its practical execution was certainly due to Lieberkuhn, in Berlin, in 1740, as we will see further on. Dr. Hooke was unfortunately constituted in several directions. He was exceedingly jealous and very morose. Ill health at various times interfered with the perfecting of several of his important inventions or discoveries in time to anticipate the fulfillment of the same work engaged in by others. This so incensed the poor old man as almost to disqualify him for work at times. Notwithstanding his failings and unpopularity, it is to him that we owe much in the advancement of science in his day. Hooke, in 1678, makes the nearest approach in these early days to an immersion lens when he says: "If you are desirous of obtaining a microscope of one single refraction and consequently capable of procuring the greatest clearness and brightness any one kind of microscope is capable of, spread a little of the fluid you intend to examine on a glass plate; bring this under one of your microscope globules and move it gently upwards till the fluid touches the globule dish; it will soon adhere, and so firmly as to bear being moved a little backwards or forwards. By looking through the globule you will then have a perfect view of the animalculæ in the drop."—*Hooke's Lectures, p.* 98.

It seems strange that so careful a compiler and historian as Dr. Priestley should neglect accrediting Dr. Hooke with what was truly due him, and still stranger when we think of them as countrymen.

Pepy's Diary, 1664, says: "Comes Mr. Reeve with a micro-

scope and a scotoscope. For the first I did give him 5l. 10s.—a great price, but a most curious bauble it is."

On February 6, 1672, Sir I. Newton communicated to the Royal Society his "design for a microscope by reflection." It consisted of a concave spherical spectrum of metal and an eye-glass which magnified the reflected image of any object placed between them in the conjugate focus of the spectrum. He pointed out the proper mode of illuminating objects by artificial light as he describes it, "of any convenient color not too much compounded," viz., mono-chromatic.

Quite a decided improvement in simple microscopes was made in 1702 by Mr. Wilson. The improvement consisted in a condenser, screw and opposing spring. The former for increasing illumination, the screw-spring for focussing.

In 1710 the elder Adams presents his method of making small globules for high magnifiers to the Royal Society.

About this time Stephen Grey introduced his "poor man's microscope." It consisted of a plate of brass pierced with a small hole, over which, above and below, he placed a drop of water.

THE PROBOSCIS AND LABIAL PALPS OF THE OYSTER.

BY H. J. RICE, SC. D.

The various changes which take place in the growth of the young of the American oyster (Ostrea Virginiana), up to about the time when the young animals cease to be a free-swimming embryo, have been pretty carefully worked out by a number of investigators during the past two or three years, but following the free-swimming condition there is a stage which, so far as I have been able to ascertain, has never been described, or at least its significance, or the relation which it sustains to the adult form, pointed out by any who have studied the embryology or habits of this interesting and valuable bivalve. I refer to what may be called the "proboscis' stage of the young animal, or that stage during which the mouth is located at the extremity of a long, slender portion of the alimentary canal which projects from the main portion of the body out into the mouth cavity. During the later portion of the free-swimming condition the digestive tract is represented by a large stomach

a rather short intestine, and a pharynx or œsophagus which may be protruded from the body as a sort of papilla with the mouth orifice at its center, or contracted so as to form a roundish cavity inside of the body walls. Gills are entirely lacking until about the time the young animal becomes attached to some "rock," when they begin to form as tubes, growing out from the body in two or four rows, which finally double upon themselves and grow back towards their origin in the body. The tubes of each row become united with each other at their ends, and afterwards at other points throughout their length, so as in a short time to form four double-walled tube-leaves, two upon either side of what may be considered for the present, the median dorsal line of the body, and extending from near one opening of the alimentary canal to near the other. Meanwhile the protrusite œsophagus grows out into a slender and quite flexible proboscis, which is only slightly if at all extensible, and is provided at its extremity with a spreading and very mobile lip or rim which surrounds the mouth orifice and which is split through upon the cephalic side, and the entire digestive tract has become very much elongated and somewhat bent upon itself so as to outline in some degree the folding of the tract as seen in the adult. I first noticed this proboscis stage of growth of the young oyster in the fall of 1878 when at work over the oyster beds in the vicinity of Crisfield, Md. I had been opening some small specimens of oysters, which were from $\frac{1}{8}$th to $\frac{5}{16}$th of an inch in diameter, for the purpose of studying their structure, when my attention was attracted by a backward and forward movement in the water of something attached to one of the little animals, and which I took at first to be a bit of the mouth or gill-plate, torn in taking off the shell, but in pushing this waving bit of tissue to one side with the end of a pencil, it spread out at the end and closed about the point of the pencil, clasping it quite firmly, and upon closer inspection I found that the bit of tissue represented the end of the alimentary canal, and that the portion clasping the point of the pencil was in reality a lip-like flap surrounding the mouth orifice of the canal. The proboscis was endowed with a certain responsive action since, whenever the point of the pencil was brought in contact with it, the proboscis would move about and the lip be directed towards the point of contact, when the pencil would be clasped as in the first instance. If left to itself the proboscis would move

slowly about in the water, waving from side to side, as when first noticed, spreading and closing its lip-extremity as if feeling for something in the surrounding fluid.

In farther examination of specimens I found that generally the lip of the proboscis was clasped around the cephalic ends of the gill-leaves, with the proboscis so bent as to look much like the handle of a jug, and the slit of the lip turned toward the mouth cavity. This is undoubtedly its normal position, and so placed for the purpose of taking up such food as may be gathered by the gills and passed along to the ends of their grooves, but there seems to be no good reason for believing but what the lip can be unclasped at will from the ends of the gills and the proboscis moved about freely within the mouth cavity, as I found in several instances when the shells had been removed. If then the young animal can in its normal condition detach the lip from the ends of the gills and thrust the proboscis about freely in the water within the mouth cavity, it is undoubtedly for the purpose of gathering, which it could do with ease, whatever food-particles it might encounter floating about in the water, or in other words, to assist the gills in gathering sufficient food for the growing body. It would indeed seem necessary that some special modification of the body should be required to aid in supplying food. In the free-swimming state the active motion in the water brings about a quite rapid change in the circulating medium and a corresponding large quantity of food material is presented for the growth of the animal; in the adult state the gills, with their numerous cilia in nearly constant motion, are sufficient to supply all the food required, but during the proboscis stage the animal has ceased its promiscuous wanderings, becoming decidedly home-keeping and domestic in its economy, hence to an important extent its food supply has been cut off, and the gills are not yet in a sufficiently advanced condition to supply this deficiency or to warrant their being relied upon alone as a means of obtaining such supplies as are necessary. It may be considered thus as fairly certain that the proboscis is a modification of the body, a contrivance designed to facilitate during the period of incomplete gill action, the gathering of food-particles from the water passing in and out of the mouth cavity,

The young oyster would then have a double chance of getting ts food, or perhaps I ought to say the young oyster would thus be

rendered much more certain of getting its food with regularity, and in sufficient abundance for its needs.

The proboscis accordingly would represent one of those adaptatives for special purposes of organs to environment of which we find so many examples in nature. The proboscis remains, as an accessory food-gatherer, until the gills are of themselves capable of supplying all the food necessary for the nutriment of the animal, when it disappears, or rather is absorbed by the growth up around it, to the solid portion of the body, which is made up principally of the ovaries, or spermaries and liver. The size of the young oyster when this disappearance takes place varies considerably. I have seen the proboscis in animals all the way in diameter from $\frac{1}{8}$ to $1\frac{3}{16}$ inches, and again I have seen young oysters $\frac{3}{8}$ of an inch in diameter, which had passed through this stage entirely. The size seems to depend largely upon the abundance of food upon the bed, those having plenty of food growing very rapidly and accordingly much larger before acquiring perfect gill-leaves than those upon beds or in locations where food is scarce. While the proboscis is thus of great value to the young oyster, in gathering food from the water as well as taking from the ends of the gills that which has been gathered by them, it is also of much importance to the adult, since the labial palps, which grind the food in grooves at their bases, from the gills to the mouth orifice, are entirely outgrowths and modifications of the lip of our quondam acquaintance, the proboscis. I have not the material at present time to represent all these changes which the lip undergoes in being transformed into the palps, but such as I have shows pretty clearly, in all except one point, the general process of the transformations which take place. If one will examine with some care the gills and labial, or mouth-palps, of an adult oyster he will observe in the first place the quite marked difference in appearance of the two, the first showing very plainly, in their ribbed or striated surfaces, the series of closely approximated tubes of which they are made up; the other looking as if quite firm and solid. In the second place it will be noticed that the four palps, which look like four triangular ears, being broader and rather pointed at or near their centers, are so arranged, two within and two without, as to form a U-shaped groove, with the mouth orifice of the animal occupying the center of the arch of the groove, and each end receiving, as one trough receives another when laid one within the other, the

end of one pair of gill-leaves, the grooves of the gill-leaves thus passing into and coinciding with the grooves or groove of the labial palps, and the strings of food from the gill-grooves, one upon either side, would thus meet and disappear down the mouth orifice.

A more careful examination will show that the outer palps are continuous around the outer side of the groove of the U from the outside of the gill-leaves of one side to the outside of the gill-leaves of the other, although just above the mouth orifice there is a depression or cutting out of the border to about one half or even more of the depth of the palps, making two ears or lobes, one upon either side and connected around the mouth by a portion of the border, which is only one half or less as broad as it is elsewhere. The inner palps are in like manner continuous from the inside of the two gill-leaves of the other and are in like manner somewhat separated by a depression in the region of the mouth, although this depression is not as deep as in the outer border. As has already been stated, the proboscis when gathering food from the gills is arched forward and the lip encloses, or surrounds, the cephalic ends, and accordingly the ends of the grooves of the four gills, the slit of the lip being on the side *away from* the gills. Now, as the body in its growth encroaches upon the length of the proboscis, the proboscis becomes necessarily somewhat straightened and shortened, and at the same time the lip becomes somewhat elongated upon the side toward the gills, in order to still connect, as a single trough, the gills and the mouth; in fact the lip becomes nearly if not quite as long as the proboscis itself. With this change in the shape of the lip there occurs also a change in its surface, brought about by the formation across the lip from side to side on that portion away from the mouth orifice, or between it and the gills, of a series of ridges which ultimately grow up in such a manner as to form a fringe of tentacles extending from the inner side of the gill-leaves of one side around by the mouth orifice in a U shape to the inner side of the gill-plates of the other side, thus forming the rudiments of the inner palps inside of and parallel to the edge of the lip which is turned up and represents the rudiments of the outer palps. By the formation of these tentacles a groove is formed between the fringe and the edge of the lip which becomes the U-shaped food groove already mentioned. The general structure of the palps seems to indicate that very soon after this groove has been formed by the growth and

modification of the ridges, the central part of that portion of the lip which lies between the ends of the gills and the body is folded up and pushed between the two sets of gill-plates, the edge finally being brought back to near the mouth orifice ; or absorption of the tissue taking place along the middle of the lip so as to divide the lip into two halves, thus leaving a doubling of the edge of the lip around the end of each set of gill-plates and the lip as thus bent and divided would exactly outline the food-groove and the labial palps as we find them in the adult. In this case the ridges, which I have stated as forming from the surface of the lip, would form a ribbed lining or inner surface to each palp, as this appears to be actually the condition of affairs. If the lip, however, does not fold up between the U-shaped fringe of tentacles, then the inner palps would agree in their theory of formation with the gills, except that the tentacles originate from the lip instead of from the body proper and do not fold up, and the outer palps would be composed of the outer edges of the lip, with a lining of ridged or tentacular origin. In regard to this point, however, I have no material at the present time to assist me in deciding ; hence, I cannot say whether the lip proper does or does not, by folding between the gill-leaves and toward the mouth orifice, take any part in the formation of the inner palps, other than to form a base from which the palps arise. This base or lower portion of the lip finally becomes attached permanently to the body and the ends of the gills by the intergrowth of connected tissue and the adult form is attained. It may be as well to state that, notwithstanding the different sources of origin of the gills and labial palps, they are both undoubtedly outgrowths from the exoderm. It will thus readily be seen that the proboscis is of considerable importance in the life of an oyster, acting as it does in the double capacity of, first, an accessory food gatherer, and, second, as the framework for the palps which direct and guide to the mouth orifice the strings of food-particles which have been arrested by the gills and rolled down to the grooves and onward to the mouth by the action of those vigorous and almost constant workers, the gill-cilia

AMERICAN SOCIETY OF MICROSCOPISTS.

ELMIRA, N. Y., Sept. 25th, 1882.

My Dear Professor Stowell:

You ask me to write a letter to THE MICROSCOPE, descriptive of the recent meeting of the American Society of Microscopists, in this city. I comply the more cheerfully because of the great success which that scientific body achieved. Successful was it, in the large number of microscopists who attended, in the new memberships added, in the discussions and papers read, and in the social aspect of the meeting. I believe it to be the universal impression among all members of the society that the Elmira meeting was by far the largest and most interesting yet held by the society. While the Elmira society has been much praised for the work done in aiding toward securing this success, we must not lose sight of the herculean work accomplished by our president, to whom, more than any one person, is honor due. I had an opportunity for knowing something of the ways and means by which he manœuvered to secure so large an attendance of members, with an ample supply of papers. In this he was eminently successful, and was only aided in his methods by the Elmira society. We have reason to rejoice that Dr. Blackham is likely to have a worthy and eminently capable successor in Prof. McCalla, who, doubtless, will bring all his well-known energy to bear upon the Chicago meeting, next year.

But to the Elmira meeting! In the first place, the place of meeting was an admirable one—a better arranged building than Park Church could not well be found anywhere. It is a large building—reaching entirely across the square—is built of stone, vine covered, and located in a shady park. It was, therefore, ample for committee rooms, cool, and in every way convenient.

The first meeting was announced for 2 o'clock, Aug. 15th. Promptly, at the hour indicated, the members who had already arrived in the city, reinforced by the Elmira society and citizens interested in scientific pursuits, had assembled in the large lecture room in the edifice mentioned. Dr. Gleason, president of the local society, in his quaint way, welcomed the visiting society in the following style:

To the American Society of Microscopists, greeting; from the Elmira Microscopic Society—not only greeting, but hearty, vigor-

ous, manly hospitality to our houses, homes and church building—everywhere that it lies in our power to invite you.

Whether our own little society was born of "colloid" or of "crystalloid" matter does not appear; whether changed by heat, light and moisture the aggregation of atoms that now go to make it up, had an "a-bioplastic" or a "bioplastic" origin—who can tell? Yet in my meditations I have been inclined to think that it did not begin absolutely by itself nor grow to its present state unaided. Who knows but the germ was some "plastidule" of thought or hint thrown out by the parent society, your own? But nourished by food transmitted to us by men of learning and thought—long since fallen asleep, urged on by those hidden forces that inspire all things of life the world over, we have attained our present humble standing in the world of science. And like some undifferentiated unicellular organism, akin to the amœba, we reach out our pseudopodia in the hope that some particles of mental food and spiritual comfort, dropped by you, may adhere to them to be absorbed, and we trust digested by us. And, perchance, by social intercourse and interchange of thought, we may become differentiated, until some day we shall no longer need wide-angled objectives to sweep a wide range of vision, nor narrow-angled ones to attain precise, close vision; but amid a higher and higher environment, our vision, now dim-eyed shall be cleared so that we shall see things as they are, without interposition of microscopes or telescopes.

A storm of applause greeted our gray-haired sire when he had done; then, Dr. Blackham responded becomingly and happily, in terms more at length, when the meeting was opened in regular form for business. Forty-four members were at once elected, when Prof. Kellicott read a paper on "Certain Crustaceous Parasites of Fresh Water Fishes"; Dr. Redding, of Newcastle, Pa., on "The Advantages of Osmic Acid as a Staining and Hardening Medium." In the discussion following, Prof. Gage, of Cornell University, pointed to the fact that osmic acid was also useful in killing, instantly, any animalcule that it was desirable to mount with organs distended—like the rotifers, for instance.

C. M. Vorce, of Cleveland, read a paper on "Forms Observed in the Waters of Lake Erie," eliciting much information in the discussion which followed and in the comparisons made with the water supply of Buffalo, Utica, Elmira and other sources. No one is

more capable than Mr. Vorce to give information relative to the entomostrachæ, so that a lively quizzing and extended discussion was kept up as to the identity of the forms and the potability of the water containing them. Some thought, and among them Dr. Taylor, of the Agricultural Department, Washington, Dr. Deeke, of the State Lunatic Asylum, Utica, that the poisonous quality of the water was due entirely to the presence of these animalcules; Messrs. Vorce, Hyatt, and Dr. Fell thought that the animalcules themselves are poisonous; while Drs. Newcomer, Gleason, Prof. Gage and the writer, attributed the poison to the condition of the water that afforded these creatures means of sustenance, i. e., that the peculiar quality of the water that permitted or made life possible in the animalculæ, was detrimental to health. At the conclusion of this discussion, the society adjourned for the evening meal. At 8 o'clock a large audience assembled in the commodious auditorium of the church to listen to the president's address. The theme was "The Evolution of the Modern Microscope," handled in the skillful manner that we would expect of one so capable of discussing it as Dr. Blackham. The address required an hour in its delivery, contained the complete history of the microscope from its earliest days to the present, and was exceedingly interesting and instructive. Of course, we cannot give even a synopsis of it in what purports to be only a letter.

On Wednesday, the second day, at ten o'clock in the morning, a much larger number of members were present, many having arrived during the night. The local committee was on hand, at every train, and safely domiciled all who wore the badge of gold, that indicated membership in the society. Three sessions were held on this day. In the morning twelve new members were elected. Then followed the appointment of a nominating committee, consisting of Dr. Mercer of Syracuse, Dr. Lester Curtis of Chicago, Prof. Ford of Elmira, Edward Bausch of Rochester and W. H. Walmsley of Philadelphia. After they had deliberated together and a majority of them had decided upon a choice for president, it was found that two additional members were required to make the committee a constitutional one. The vacancy was filled by adding Dr. Fell of Buffalo, and Prof. Stowell of Cortland, who sided with the minority and gave us the excellent ticket for officers which was duly elected

without a dissenting vote. So passed the election, harmoniously and satisfactorily.

Then came the reading of the following papers, the first two by title: "The Basis of the Natural Classification of Plants by Orders, Genera and Species Found in the Features of Their Seeds," by J. I. Brownell, of Mansfield, Pa. "The Epidermis of the Cyclostomata" and "A New Species of Fluke from the Muskrat," by Prof. A. H. Tuttle, of Columbus. A paper on "Fresh Water Sponges," by Henry Mills, Esq., of Buffalo, I need not tell you, was exceedingly interesting, coming from such a universally recognized able source. The discussion that followed was aimed principally at the system of classification and was participated in mainly by Prof. Kellicott, Messrs. Vorce and Mills, Dr. Lucy of the Elmira society, and Dr. Fell of Buffalo. Dr. Blackham then read Ernst Gundlach's elaborate paper on "Light and Illumination." It treated of many of the difficulties that environed transparent illumination—how increased powers give greater magnification to the exclusion of satisfactory illumination and definition. This brought forth an exceedingly interesting discussion, conducted on the one side by Drs. Curtis and Mercer, who clung to the teachings and principles of Prof. Abbe, while a host of other members assailed them. Finally, Dr. Gleason brought the discussion to a timely close by offering one of his characteristic propositions, as follows: "The question then seems to be whether we see what we see; whether we don't see what we see; or, whether we see what we don't see! This closed the morning meeting. In the afternoon, at 2 o'clock, six new members were admitted to membership. Prof. Gage suggested that the public be not admitted to the soireè to be held to-morrow night, until 8 o'cock, in order that exhibitors have the hour from 7 to 8 to inspect each other's exhibits. This was agreed to and the decision publicly announced. Prof. Kellicott attempted to read his paper on the "Polyzoa," by title, but the society knew too well the value of his productions to let him off quite so easy. He was requested, by vote, to read his paper in full, which he did later.

Dr. A. M. Bleile, of Columbus, read a paper on the "Effects of Division of the Vagi on the Heart," showing much careful study and skillfulness in conducting his experiments. By means of vivisections performed upon rabbits, it was found that when both vagi are severed, the animal is sure to die either from traumatic

pneumonia or fatty degeneration of the heart's muscular tissue, while section of but one of the vagi causes both these difficulties only in a limited degree—not sufficient to cause death. This afforded another round of discussion in which the medical men took part, all praising Dr. Bleile for his carefully prepared paper when the society voted to have him continue his experiments that further results may be had for our next meeting.

M. L. Holbrook, of New York, who has been quietly pursuing the "termination of the nerves of the liver," in Dr. Heitzman's laboratory, told us of the results of his researches in a modest but thoroughly convincing manner. The Doctor found that the nerve fibrils do not terminate in the liver cells, as claimed by Pflueger, but in the walls of the capillary vessels, as first revealed by Nesrerowsky. From three to five ramifications enter each of the lobules, taking their course along the capillaries. The specimens exhibited in illustration of the paper, were frozen and cut in a microtome, vertically across the arteries and stained in chloride of gold and formic acid.

The moment it was known that Dr. Holbrook came from Heitzman's laboratory, the discussion upon the paper gradually drifted into the consideration of the so-called reticulum of the blood corpuscle.

Drs. Barrett and Holbrook feebly protected Heitzman's manipulation of the lenses.

Dr. Stillson, of Indiana, had seen the reticulated structure under Dr. Heitzman's instruments, but was never able himself to discover it. Dr. Blackham thought that Dr. Heitzman's error grew out of the use of very imperfect objectives, and explained how such a result could be given by using the Hartnack lenses. Dr. Mercer ascribed the reticulum to the source of error claimed to have been first discovered by Abbe.

Dr Deeke, a most patient and pains-taking investigator, had searched for this structure but had only seen it under certain microscopically suspicious circumstances; he was inclined to attribute the effect of net-work to abnormal configurations of granular matter, caused by the action of the bichromate of potash, used in preparing the corpuscles. Dr. Bleile recited the results of Ludwig's experiments, at Leipsig, which tended to show the organization of the red corpuscle. The president finally concluded the discussion by

announcing Prof. Rogers, of Cambridge, who read a very entertaining paper upon micrometric measurements, showing some exceedingly fine apparatus and delicately ruled steel and glass bars, in illustration of his subject.

He demonstrated the irrelevancy of all "statutory" units of measure, pointing out the futility of the prevailing methods of guarding against fluctuations caused by changes in temperature. He showed the fallacy of such a term as "probable limit of error," and the occurrence of certain errors overlooked in making correct measurements, instancing and dwelling upon the focal error. He exhibited a combined yard and metre, which was ruled to the utmost degree of accuracy possible to be obtained by any contrivance or surroundings known to science. At the conclusion of Prof. Rogers' remarks, the society adjourned to 8 o'clock in the evening, at which hour the fine lecture room was completely filled, Four new names were added to the roll.—Geo. C. Taylor, of Tibadeaux, La., better known as "Old Gray Beard," exhibited a new mechanical lamp—a modification of the Hitchcock lamp, in which the burner is brought very low upon the table, while the intensity of the light is regulated by a movable diaphragm, which increases or curtails the volume of air admitted to the fan. A practical test of the light, in resolving fine lines, proved its superiority over all lamps yet devised. W. H. Walmsley, your valuable contributor from Philadelphia, was on hand with several new appliances to be used in microscopy and in photography. He gave us a practical paper on microphotography, illustrating the same by taking a microphotograph of a fly's tongue, on the spot. This brought out a very useful discussion from the photographic fraternity, in which numerous suggestions were made, and from which many valuable hints were gleaned, too numerous, by far, to enumerate in this letter. Prof. Hamilton L. Smith then devoted the remaining hour-and-a-half to his memoir of Charles Spencer, which you will probably print and so spare me in attempting even a synopsis of it.

The Thursday morning session opened at nine o'clock, when four more members were accepted, and several reports of committees received and acted upon. Prof. McCalla, from the committee upon the publication of a quarterly journal, reported that it was not just then advisable for the society to establish a separate and independent journal.—Uncle Griffith exhibited his improved club stand,

with turn-table and lamp-holding attachment. As now arranged, it is a very complete and compact stand, capable of doing the best work.

Dr. Theo. Deeke, special pathologist to the Utica Insane Asylum, by special invitation, exhibited his monstrous stand, upon the stage of which he exhibits an entire section of the adult human brain. A number of these splendid sections were shown and his methods of preparation, section cutting and staining, fully explained.

Dr. Thomas Taylor, of the Agricultural Dept. at Washington, exhibited his new freezing microtome, the freezing fluid (produced by salt and ice) being conducted from a tank, through a rubber tube, into the cylinder of the microtome, on top of which the specimen is frozen, in gum water. The Dr. argued that the structure of all tissues, hardened by chemical agents, is more or less distorted. His microtome is a great improvement, in many respects, over anything that we have seen of that character. The freezing mixture is cheaper than ether or rhigoline, beside, no extra person is needed in producing the freezing vapor.

Dr. Ward, of Troy, N. Y., reported that the committee upon "Uniformity in Eye-Pieces" had secured replies from all manufacturers save one, who agreed to style their eye-pieces according to their focal length, but that no agreement had yet been secured as to diameter of tube. Prof. Rogers was elected the representative of this society to act with Prof. J. E. Highland and other officers of the United States Coast Survey, in obtaining precision in micrometry.

At the afternoon session six new members were received. Prof. J. D. Hyatt, of Morrisania, N. Y., read a paper showing the concommittance of frequently observed sporadic proliferation of certain diatoms in the croton water supply, and its contamination of the same. The same perodic frequency of the forms mentioned were observed in the Elmira and other waters. Dr. Robert Dayton, of Cleveland, exhibited, by means of suitable diagrams, an improvement in the half-button illuminator. Prof. Simon Gage, of Cornell University, then read a very instructive paper on "The Relation of Fat Cells to Connective Tissue." The professor epitomized his paper, at its close, as follows:

"1. With the use of the microscope as an instrument of research, it is unmistakably shown that the fat of the body is not free

in the tissues, but in small circumscribed masses which with the development of the doctrine of the cellular structure of the animal body, were considered as cells.

"2. With the growth of the conception of the unity of life, the complex structure of man has been investigated through the lower animals, and adipose tissue is now recognized by all as composed of protoplasmic cells, simply holding their fat in readiness for the use of the body.

"3. This paper attempts to show that by the study of adipose tissue in a very simple form, the conflicting views as to the origin of the fat cells may be harmonized. And while its main thesis is that fixed unbranched, connective tissue corpuscles may become fat cells, it also holds that the special or migratory cells of Rauvier and others may likewise serve as fat reservoirs, and finally our knowledge in its present state points unmistakably to the conclusion, that after a cell has given up its fat it reassumes in full its previous functions."

Prof. Chas. B. Parker, of Cincinnati, suggested the possibility of the fatty tissue being a veritable organ, somewhat of the nature of a gland, basing his idea upon the afferent and efferent vessels, nerves and lymphatics which it is found to possess. This Dr. Thos. Taylor opposed in quite an extensive discussion.

Prof. Rogers was down for a paper on "The Naked-Eye Visibility of Single Ruled Lines Not Exceeding 1-100.000 of an Inch in Width." Unfortunately, he was summoned away by telegraph before his paper was reached. It was, therefore, read by title, as was also the two following papers, their authors being prevented from participation in the meeting by reason of sickness: "The Vegetable Nature of Croupous Membrane," by Dr. Ephraim Cutter, of New York. "The Fasoldt Stage Micrometer," by S. E. Mendanhall.

Next Dr. Mercer spoke of the "Stereoscopic Effects Obtained by the Powell & Leland High Power Binocular Arrangement," after which Henry Mills alluded briefly to the "Microscopic Organisms in the Buffalo Water Supply and Niagara River." For lack of time Dr. Lester Curtis' paper on "Micro-organisms Found in the Blood of a Case of Tetanus," was read by title. A half hour was then allotted to discussion of various themes. Prof. Chester, of Hamilton College, described a simple method of making cell rings. Prof. Allen Y. Moore demonstrated an ingenious modification of the ordinary camera lucida, consisting of a silvered disk somewhat

smaller in diameter than the pupil, centered upon a round cover-glass, which is attached to the eye-piece in the usual manner.

This brought the regular business of the society to a close, since the soireè came next in order; then the excursion and banquet on the morrow.

Dr. Lewis M. Eastman, of Baltimore, at this point arose and offered the following:

Resolved, That the thanks of this society are eminently due, and cordially tendered to the citizens of Elmira—to the pastor and officers of the Park church—to the local society and its committee, with its indefatigable chairman, for the cordial welcome they have given us, and their successful efforts for our comfort and entertainment.

Which was followed by Dr. Newcomer:

Resolved, That we record our hearty appreciation of the comprehensive and accurative reports of our proceedings as published in the Elmira *Advertiser*, and reported by Dr. Krackowizer.

Both resolutions were adopted with unanimity, accompanied by words of the most flattering compliment from many speakers, and were fitly responded to by the secretary of the Elmira society and Dr. Krackowizer.

In the evening occurred the soireè, in which the American and the Elmira societies both participated, and such an exhibition of fine instruments, magnificent accessories and beautiful objects was perhaps never before seen at one single display. The lecture room, romp room, parlors, library and committee rooms were all used in the exhibition. The vast building was thronged with delighted spectators from eight to half-past ten o'clock. A rush was prevented by distributing the numerous microscopes over the building, locating something of unusual interest in every room. Edward Bausch showed his electric light attachment to the microscope in the rear parlor. Mr. Walmsley displayed his magnificent microscopes and attractive objects in the front parlor. Mr. Pennock showed Queen's instruments in one ante-room and Sexton had Gundlach's microscopes and objectives in an adjoining one. Dr. Deeke exhibited his immense brain sections, on his large stand, by means of Prof. Ford's electric light, in the lower room, being surrounded by fifty or more exhibitors of various curious objects. In the romp room, or theatre, up stairs, was Prof. Gage, showing the circulation

in the gills of a menobranchus better than I had ever seen it before, attracting crowds of interested spectators to his table. Surrounding him, in all parts of the room, were other exhibitors, all aiding to the best of their ability, in making the soireè a success. And it was a magnificient display, surpassing anything ever before attempted in this country.

During the evening, the Elmira Society distributed tickets to all members of the American Society, entitling them to a ride to Watkins and return. Admission to Watkins Glen. Dinner at Glen Mountain House. Ride on Seneca Lake. Early on Friday morning, the excursionists assembled at the station, and took the cars at 8 o'clock for Watkins, where they arrived an hour and a half later. Carriages were provided for their transportation to the mouth of the Glen through which they rambled until dinner was announced. After dinner, they were again carried to the station where they embarked on a steamer for a pleasure ride on the lake. After they were fairly afloat, they were called to order, on the roomy deck, and a little after-dinner specifying indulged in. The toast-master appeared and offered the following sentiments:

"The American Society of Microscopists"—Delving among the minute forms of nature, gleaning knowledge that raises men higher and higher, nearer and nearer to his God. Responded to by Dr. G. E. Blackham.

"The Power of Attraction"—Drawing and cementing together all minds which share alike a reverence for the material and spiritual. Responded to by Dr. W. C. Barrett.

"The Wide, Wide West"—Boundless as to its prairies, enterprise and hospitality. Responded to by Prof. A. H. McCalla.

"The Border Land"—That mysterious line which divides the animal from the vegetable kingdom around which linger many diligent explorers. Responded to by Prof. H. L. Smith.

"Man's skill in Imitating Nature"—the rules of mankind enforce respect by power of arms. Our ruler, though his kingdom is of glass, has no rival for his throne. Responded to by C. M. Vorce.

"The Microscope as a Detective."—Men for ages have traced death by means of blood stains, but more has been reserved for the present generation in tracing life through staining blood. Responded to by Dr. Allen Y. Moore.

"The Brass and Glass Men."—Invaluable aids to the scientist. Colaborers in a common cause. To their wonderful accuracy, skill and ingenuity microscopy owes everything. Responded to by "Uncle" Griffith.

"The Ladies."—The highest type of differentiated protoplasm around which cluster an allied group--the men. In microscopy, as in all else, they are determined men shall have no secrets they do not share. Responded to by George C. Taylor.

In these responses it was shown that scientific men can indulge in wit and pleasantry when the occasion requires. When the toast-master had perpetrated his little jokes on the several parties he had called out, he took his seat; then, Dr. Barrett arose and said he proposed that that gentleman should swallow some of his own physic, and offered the following:

Elmira, our hostess—the Queen City, peerless among entertainers, and our friends of the microscopical society—her worthy children.

After which he called that toast-master by name, who, after some sort of a response, called Prof. Ford, of the Elmira College, to his aid, thus securing admirable help out of the difficulty. And so ended the merry-making. Soon the excursion train reached Elmira, good-byes were regretfully said, "we will all meet in Chicago next year!" proclaimed, and the fifth annual meeting of the American Society of Microscopists was at an end.

These meetings are provocative of much good in various directions. They are good for the microscopists themselves—permitting them to compare notes, one with another, and so improve their methods, as well as often adding to their resources. They benefit, also, the community in which the meetings are held—interesting the people in scientific pursuits and desirable acquaintances.

Our people—our best citizens—opened their pleasant homes to the members of the American Society and entertained them right royally. Many sincere regrets were expressed when our guests found it necessary to return to their own homes, and many hearty invitations were given them to come to Elmira again.

Count the fifth annual meeting of the society a magnificent success—in every particular—and believe me,

Very truly yours,

THAD. S. UP DE GRAFF.

Selections.

AN ECONOMICAL CABINET FOR MICROSCOPICAL SLIDES.—For some years past the writer has been looking around for some form of cabinet, which would hold securely several hundred slides, and yet would not be expensive. The desire for this he has found to be shared by many others, especially medical students. The need is, as a rule, most especially felt when the collection enters its second hundred. Till then very little classification or special arrangement is necessary; and the usual make-shifts, the ordinary mailing boxes, serve sufficiently well. Later still, when the size and value of the collection are assure, one feels more at liberty to make a larger outlay upon its receptacle.

The trays of binder's board, so much used by students abroad, seemed a good basis for such a cabinet; and as the result of some experimentation he would call attention to an arrangement which now seems very satisfactory.

It consists of trays of binder's board of two sizes, the larger 11x8 inches, the smaller 11x4. Each of the smaller consists of a solid bottom of binder's board, upon which is glued a second piece of the same size, from the centre of which a piece 10x3 inches has been cut out. This, then, forms a tray about a line in depth, capable of holding ten slides. A third piece, from the centre of which a portion 10x1 inches has been removed, is hinged to the others so as to form a cover, the slot in its centre securing even deep cell preparations from pressure. The larger trays differ only in being of double size and holding twenty slides. Some of the trays have a fourth piece of lighter material covering the slots in the tops, and thus rendering them complete, dust-tight boxes. In series, however, this is unnecessary, as the covering of each tray is completed by the bottom of the one above. Each tray is, therefore, independent, a rubber strap about it rendering it entirely secure for holding or transporting specimens, while any number of them can be combined and further secured in a wooden case, making a neat and safe cabinet. The student can buy these boxes as he has need of them at the same cost as the ordinary mailing boxes, and whenever it seems worth while, have them made up into a cabinet.

Such a cabinet, now before me, is 12x9 inches, by 10 inches in

height, solidly made of black walnut. The lock and hooks which secure it having been unfastened, the top lifts and the front falls, exposing to view the series of closed trays capable of holding 500 slides. Each tray must be withdrawn from beneath those above it in order to get at its contents, and they must be lifted again in order to replace it. Otherwise it is as convenient as any other form, while it has the great advantage that any one of its trays may be used at any time as an independent box; still further, its cost is about one-third of any comparable cabinet advertised by the dealers. The binder's board trays have, when first made, a little tendency to wrap, and had better be kept under pressure, but this is only temporary.

Such cabinets, to hold 500 slides, consisting of fifteen of the larger and twenty of the smaller boxes, contained in a neat and strong walnut box, with lock and handle, are manufactured by Mr. Ivan Fox, optician, 1632 Chestnut street, Philadelphia, and sold at fifteen dollars.—B. Alexander Randall, M. D., in *Western Medical Reporter*.

Mounting in Glycerine.—Dr. S. R. Holdsworth finds the following plan to be efficacious in avoiding the difficulty found in getting rid of the surplus glycerine when it has passed beyond the cover-glass. He puts a very small drop of glycerine upon the object, just sufficient that when the cover-glass is applied it will not extend to the margin. A solution of Canada balsam in chloroform or benzoline is then run in to fix the cover-glass, and not being miscible with the glycerine, an air-space is formed between the two fluids which has not been found to be detrimental. The slide can be finished with a ring of balsam or other cement.—*Am. Rep. Pos. Mic. Soc.*

W. Pfitzner prepares dammar varnish as follows: Gum dammar, benzine and turpentine, equal parts; when solution has taken place the clear liquid is poured off and allowed to evaporate to proper consistency.

Items.

Mr. Tolles claims to have made objectives with tapering fronts over ten years ago.

Send to our advertisers for a catalogue and see if they have anything new. Keep posted.

Eugene Pinckney, of Dixon, Ill., will exchange rubber cement of his own manufacture for good slides.

Mr. J. Lee Smith, of New York city, prepares slides of embryo chicks that "seem to be absolutely perfect."

Mr. Crisp, of London, describes a microscope made fifty years ago. It was four feet high and had a tube four inches in diameter.

A bulls-eye condenser can be made from an old fashioned bulls-eye watch-glass filled with glycerine and covered with plate glass.

Our new work on MICROSCOPICAL DIAGNOSIS is now ready to be delivered. Please notice the clubbing rates in our advertising pages.

Mr. Stewart, of London, found *Amoebæ* crowded with refractile points. They were distinctly crystalline in character and had a vesicular nucleus.

Volvox globator, mounted alive in glycerine jelly, as cool as possible, will keep well with but slight loss of color. Also if mounted in Canada balsam.

Our subscribers can help us very much by asking their friends to send us a dollar for a year's subscription. The more dollars you send us the better the journal we will send you.

Langfeldt has found that half a gramme of citric acid to one litre of water will kill all organisms in impure water—except *cyclops*—in two minutes, and not injure the water for drinking purposes.

In the *Rev. Mycologique*, IV. 1882, pp. 194-200, the French scientist, C. Roumeguére, notes the rapid progress of microscopy in the New World, and makes special reference to the work of the editors of THE MICROSCOPE in the University of Michigan.

Editorial Department.

THE fifth annual meeting of the American Society of Microscopists must be regarded as the most successful meeting of the kind ever held in this country. A very active local society did much toward bringing this about. Earnestness on the part of the members should also be taken into account. Chiefly, however, should we acknowledge the faithful services of the officers of the association.

Ex-President Blackham deserves and receives great praise for the work he accomplished. He was no sooner elected to his position than he commenced to work, and he did not rest until the motion was made, at Elmira, to adjourn *sine die.*

Secretary Kellicott brought one year's experience to his position. It is difficult to conceive how his work could have been more acceptably performed.

All things worked together for the complete success of the Elmira meeting.

THE MICROSCOPE intends to do its part toward making the Chicago meeting as successful.

IT was certainly a very difficult question for the American Society to decide—"Who shall be our next president?" The committee showed its intelligence by nominating for that office Professor Albert McCalla, of Fairfield, Iowa. We knew of Professor McCalla, first, as pastor of one of the largest churches in Chicago. For several years past he has occupied the chair of Physical and Natural Sciences in Parson's College at Fairfield. About three years ago Professor McCalla organized the Fairfield Microscopical Club, and has been its president since that time. He became a member of the American Society at the Detroit meeting, and during the past year has served on the executive committee. During the several years that Professor McCalla has been interested in microscopy he has contributed to scientific journals, and has frequently given papers before various teachers and scientific associations.

We venture to predict that in our new president we will find a man well acquainted with parliamentary law, a good presiding officer, an able speaker and an active worker with the microscope.

AT the meeting of the American association for the advancement of science, held at Montreal, Dr. B. W. Carpenter, the eminent microscopist of London, gave an address. We quote a few of his statements. "Increased angle has given great power of resolution, but what else? Nothing at all. Angle can only be obtained by lessening the working distance. The result is we see nothing but what is in the focal plane. * * * The best lenses have as large an angle as is compatible with requisite focal depth. * * * It has been claimed that low powers of high angle are equal to higher powers; that a $\frac{4}{10}$ with wide angle will do everything. It will resolve tests, but its continued use will injure the eyes. * * * Dr. Dallinger believes if he had worked with a $\frac{1}{8}$ instead of a $\frac{1}{25}$ he would have injured his eyes. I hear of Americans making one-inch objectives up to great angles, for which the society screw is too small. This makes a very bad $\frac{1}{4}$ and spoils it for a one-inch. * * High power eye-pieces are valuable for testing objectives. * * * The flagellæ of Monas termo would probably not have been found without the wide angle lens, but now that they are known to exist, they have been seen better with a lower angle. A $\frac{1}{8}$ inch of 40° was ordered of Powell & Lealand, who at first were unwilling to make such a low angled glass, but finally did so, and at a public soirée it was exhibited by the side of a $\frac{1}{8}$ inch of 90°, and the difference between them was so striking as to attract universal attention and commendation of the low-angle lens."

THE exhibits at the American Society were very fine. The exhibit of

JAMES W. QUEEN

was under the charge of Mr. Edward Pennock. Eight compound microscopes were exhibited, together with an interesting variety of microscopic objects, books, accessories, etc. A low-power objective was much admired. The power of this objective is increased or decreased by the turning of a graduated collar. The field of this objective ranges from five-eighths to two inches across. Complete sets of Professor Abbes' diffraction plates and diaphragms were exhibited. A new mechanical finger, designed by Prof. Kain, was

well received, picking and turning the diatoms very neatly. The new staining preparations of vesuvin and anilin blue were on exhibition. Two forms of the camera lucida should be mentioned, also an Abbe test plate. This firm has just issued some new catalogues containing many new and desirable things. You can obtain copies for the asking.

BAUSCH AND LOMB.

Mr. Ed. Bausch exhibited a number of instruments, including their new "professional." The objectives from this house were carefully examined, for it was with one of their homogeneous immersions that Dr. Up de Graff resolved the band on Fasoldt's plate said to be ruled 152,400 lines to the inch.

This firm has just issued a new catalogue, containing about double the amount of former ones. They are now prepared to furnish a full line of accessories. These new catalogues will be sent on application.

R. & J. BECK.

Mr. W. H. Walmsley had a full line of goods from this firm on exhibition. The prices ranged from the "Scholars" at $25, to the "International" at $1,650, equipped with objectives ranging from $7 to $150. Two of our friends in Jackson, Mich., own "Internationals." We refer to Gen. Wm. Humphreys and Mr. Bennett.

Mr. Walmsley furnishes catalogues to all who apply.

GUNDLACH.

Mr. L. R. Sexton was present with a fine stock of this ingenious optician's goods, but was prevented from exhibiting them on account of a sudden and severe illness. He is ready to furnish catalogues.

FOR several weeks during the past summer we had the pleasure of working with Mr. C. B. Allaire, of the firm of Allaire, Woodward & Co., Peoria, Ill. Mr. Allaire not only understands the use of the microscope, but also puts his knowledge to the practical

test in purchasing goods for their house. This firm has a great reputation for the purity of its drugs, and Mr. Allaire says that the microscope has played no small part in the acquiring of it.

WE ask our medical friends to send for a sample of Reed & Carnrick's new preparation of Beef Peptonoids. It fills a very important place in the practitioner's materia medica. We have practically tested it and declare it to be far superior to any of the various beef extracts with which we are acquainted. It was used with great success in the hands of Doctors Agnew and Hamilton in the treatment of President Garfield.

A LINE just received from Mr. Walmsley says that he will be unable to have his fourth paper on Mounting ready for this issue of the journal, "but you will surely have it for your December number."

Please notice the extra number of pages in this issue.

Reviews.

Practical Microscopy. By George E. Davis, F. R. M. S. Second edition. Illustrated with 258 wood-cuts and colored frontispiece. 8 vo.; pp. 350. 1882. J. B. Lippincott & Co., Philadelphia.

This is essentially a practical work upon microscopy. The different stands of foreign make are illustrated and described, followed by their accessories and objectives. There is but little that is new in the first half of the book, but the chapters on "Staining" and on "Reagents and Recipes" contain some valuable things, and are alone worth the price of the book. The author's process for the double-staining of vegetable sections is very good indeed, and gives beautiful results, as a number of our sections will testify.

As microscopists, we have a very limited literature. A demand should be created for more by patronizing what we have. But the book before us has intrinsic value, as we trust our readers will find out for themselves.

Materia Medica and Therapeutics. Inorganic Substances. By Charles F. Phillips, M. D. Edited and adapted to the United States Pharmacopœia, by Lawrence Johnson, A. M. M. D. Two volumes. New York: William Wood & Co.

These are the April and May numbers of Wood's Library of Standard Medical Authors for 1882. The text is very complete and brings the subject up to the most recent information. Therapeutics must form the larger part of the successful practitioner's library. It should have a place by Bartholow, Trosseau and others. Two full indexes are given, one for remedies, the other for diseases.

Journal of the Royal Microscopical Society. Edited by Frank Crisp, L. L. B., B. A. August number. Ill.; 8 vo.; pp. 150,

Filled as usual with matter of the highest value to every worker in science. Mr. Crisp has acquired a lasting name from the successful way he has conducted this journal.

Our Native Ferns and Their Allies. By Lucien M. Underwood, Ph. D., Professor of Botany in the Illinois Wesleyan University. Second and enlarged edition, 8 vo.; pp. 134. Illustrated from nature. 1882. Address the author, Bloomington, Ill.

The delicate foliage of the ferns causes them to be sought after

for cultivation in our conservatories and, when pressed and dried, for household decorations. The work before us gives very close and careful directions how to study and understand the various forms of fern growth. Our readers interested in botany will be glad to improve the opportunity to obtain this accurate "text-book."

Psychology of Salem Witchcraft. By Geo. M. Beard, A. M., M. D. New York: G. P. Putnam's Sons, 27 and 29 W. Twenty-third street. 1882. Price $1.00.

Whether we do or do not endorse what this writer says does not alter the fact that the book is certainly very interesting reading. The author claims to prove the parallelism between the Salem witchcraft trials and the trial of Guiteau, and asserts that the future will read these and the trial of Whittaker alike. We call attention to "Appendix B," "Can the insane be legally punished?" You will think about the book after you have read it.

The Multum In Parvo Reference and Dose Book. By C. Henri Leonard, M. A., M. D., Professor of the Medical and Surgical Diseases of Women, Michigan College of Medicine. Thirty-fourth thousand. Price in cloth, 75 cents. Popular Edition in paper, 30 cents. Illustrated Medical Journal Co., Detroit. 1882.

It is the most complete dose book we have ever seen. Its other contents are indispensible to the practitioner. The information is valuable, practical, concise and very complete. It contains: Medium and maximum doses; list of incompatibles; poisons and antidotes; tests for urinary deposits; obstetric table; weights and measures; emergencies; and several pages of interesting matter, appreciated by the busy practitioner. No wonder it has reached its immense sale.

Botanical Ready Reference, Designed for Druggists and Physicians. By T. M. Nickell's, Chicago, Ill. 8 vo., pp. 268. Morocco binding. 1882.

This compiled work contains all of the botanical drugs known up to the present time, giving their botanical, common, and German names, together with their medicinal properties. The druggist, especially, will find this work of invaluable help in his business. It is a clear, plain, ready-reference book that any druggist will appreciate. It is something the drug trade has very much needed.

The Vest-Pocket Anatomist. Founded upon Gray. By C. Henri Leonard, A. M., M. D. Eleventh Revised Edition. Tenth thousand. Price in cloth, 75 cents. The Illustrated Medical Journal Co., Detroit. 1882.

This book can readily be carried in the vest-pocket. It is sufficient for the student in the class-room and the dissecting-room. It is Gray's Anatomy—vest-pocket size.

WHAT TO DO IN CASES OF POISONING. By Wm. Murrell, M. D., M. R. C. P., Lecturer on Materia Medica at the Westminster Hospital, London. Pocket manual in cloth, embossed in gold. Pp. 95. Price $1.00. Geo. S. Davis, Detroit, Mich.

It contains plain, straightforward directions for the treatment of the common poisons. It recommends that each physician should have ready for use an "Antidotal Bag"—one of the most useful of the pocket manuals.

THE MUSCLES OF THE LIMBS OF THE RACCOON. By Harrison Allen, M. D.

A comparison of these muscles with those of man and the cat. A great deal of labor is given in 40 pages large 8 vo.

SULPHATE OF QUININE. By O. F. Manson, M. D., Professor of Physiology in the Medical College of Virginia. 12 mo., pp. 164. J. B. Lippincott & Co., Publishers. 1882.

The book contains all the known facts concerning this valuable remedy. It is concise, clear, full of instruction. Physicians having to deal with intermittent and remittent fevers should become familiar with the therapeutics of this main-stay.

FIRST BI-ENNIAL REPORT OF THE MICHIGAN FREE EYE AND EAR INFIRMARY, Michigan College Hospital. By C. J. Lundy, A. M., M. D., Surgeon in Charge. 8 vo., pp. 28. 1882. Geo. S. Davis, Publisher, Detroit.

The total number of eye cases treated was 2,083. Total number of operations, 325. It is one of the things we cannot explain, how Professor Lundy can do the work represented in this report, attend to his college duties as a full professor of ophthalmology, and still keep the largest private practice, in diseases of the eye, of any physician in Detroit. The doctor's contributions to the press are frequent. All his work is characterized by thoroughness and zeal.

LECTURES ON SOUND AND LIGHT. By Charles K. Wead, Professor of Physics, University of Michigan. 8 vo., pp. 13. Price, 50 cents.

A synopsis of the lectures Prof. Wead gives to his students.

Proceedings of a Convention of Agriculturists Held in the Department of Agriculture, January 10th to 18th, 1882. Government Printing Office, Washington.

Transactions of the Michigan State Medical Society for the Year 1882. Lansing, Mich.

Some extracts will be made from these transactions in the next number of this journal. Dr. Geo. E. Ranney has performed his work as secretary in a most satisfactory and expeditious manner.

Origin and Growth of Sheep Husbandry in the United States. Government Printing Office, Washington. 1882.

Florida: Its Climate, Soil and Productions. Government Printing Office, Washington. 1882.

An Old System and a New Science. By F. E. Stewart, Ph. G., M. D. A copy may be obtained by addressing the publisher, Geo. S. Davis, Detroit, Mich.

Tea-Culture as an American Industry. By Wm. Saunders. Government Printing Office, Washington.

Forms Observed in Waters of Lake Erie. By C. M. Vorce. Plate and descriptions. 1881.

THE MICROSCOPE

AND ITS RELATION TO

MEDICINE AND PHARMACY.

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CONTENTS.

Original Communications.

THE HISTORY OF THE MICROSCOPE AND ITS ACCESSORIES.

BY J. W. CRUMBAUGH, M. D.

FOURTH PAPER.

MR. GREY found that when the water thus employed contained animalcules, that they appeared much larger than if viewed beyond the globule. Montucla (Vol. 2, p. 610) gave as an explanation for this, that the hinder part of the globe acted as a concave mirror, provided the object was located below that surface and the focus, and it is thus objects are magnified 3½ times greater than if placed outside the globule.

Micrometers were added to microscopes during this era. Mr. Gascoigne, in 1640, first produced one. Gascoigne measured his object by the approach of two straight edges ground sharp in the

focus of objectives. As an improvement, Dr. Hooke suggested the substitution of two fine hairs stretched parallel one to the other.

1666. Auzont and Picard described a micrometer made of silver wire.

When Hooke was shown Gascoigne's instrument, he gave a sketch and description of it with several improvements (Phil. Trans. Vol. 1, p. 217). (Other methods of Hooke, see Posthumous works, p. 497.)

1662. Marquis of Malvasia, used the method for measuring afterwards published by Auzont and Picard, saving that the latter sometimes substituted silken thread, very fine, for the silver wire.

Dechales and De la Hire both used same micrometers as described. Later, De la Hire recommended the drawing of circles on glass for telescopic uses.

Leuwenhœk's method of measurement, crude though it was, came quite near accuracy. He estimated size of objects by comparing them with grains of sand scattered on plate with object. He considered 100 grains in line to constitute an inch. By this method he decided the red blood corpuscle to measure $\frac{1}{1940}$ inch. Dr. Jurim's method was quite similar to his distinguished contemporary, Leuwenhœk. He found the diameter of a fine silver wire by wrapping it closely about a small cylinder for the length of an inch. Then counting his wraps he obtains its thickness. He then cuts this up into small pieces and uses it the same as Leuwenhœk does the sand.

Martin recommends the ruling on glass of parallel lines at known distance apart and placing this in focus of eye-piece.

Hooke viewed the objects with one eye and a graduated measure placed at same distance with other. Thus by casting the image, as it were, on the ruler, he was able to approximate correctness of dimensions.

1625. Erasmus Bartholin first noticed the peculiar effect upon light by Iceland spar. He made quite a number of observations on objects viewed through this medium.

M. Huygens, died 1695, made many additional and valuable observations, being much more accurate in his descriptions than his predecessor. He found that double refraction was not peculiar to Iceland spar, but was possessed in less marked degree by several other substances.

Newton makes no original investigations in this direction, but suggests the most probable explanation of the facts discovered.

Beccaria and Martin added some to the already made observations.

After the construction of the reflecting telescope, it was natural to apply the same principles to the microscope. This was done by Dr. Robt. Barker[1] and Dr. Smith.[2] Neither of these constructions became popular, owing to expense and difficulty of manipulation.

About this time, *i. e.* 1738–39, Lieberkuhn produced his solar microscope, and reproduced the opaque illuminator of Leuwenhœk, to condense and render more uniform the light as reflected from mirror. His objects were all the most "curious anatomical preparations," some of which, with the microscope, can now be seen in the British Museum. When in England, in 1739, he showed these instruments made by himself to several gentlemen, among whom was the optician, Mr. Cuff, who thereafter made solar microscopes after this design. These inventions, together with Trembley's discovery of the polyp, gave a new impetus to this almost dead science. As made by Cuff, they consisted of a Wilson's pocket microscope plus a large tube, condensing lens and mirror. The tube was intended to adapt to hole in shutter. The mirror, regulated by jointed wires, reflected the rays through the condensing lens into the tube and thence through the microscope attached to the end of tube. This same crude arrangement was brought out in Chicago a few years since as "McIntosh's solar microscope." The concave reflector known now as "Lieberkuhn" we are all so well acquainted with as to render description and remarks unnecessary.

Every optician now bent himself to "improve" the microscope, in other words, he strove his utmost to make it in all respects different from that of his neighbor. As a result, the instrument, instead of being improved, lost many of the advantages of the older forms. At this same period, M. Buffou's famous system of organic molecules was given to the world, as well as Needham's theory of vegetable force and the vitality of matter—both came from the microscope.

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1 Phil. Trans., Vol. 8, part 1, p. 120.

2 Smith's Optics, p. 94.

His solar microscope he improved so as to permit of projection of opaque objects. His death prevented the publication of his methods, and his heirs never seemed disposed to give information respecting this particular instrument.

M. Alpinus used many endeavors to ascertain concerning the construction of this instrument by Lieberkuhn, and while thus engaged he became fascinated with the subject, and so he himself set about improving Lieberkuhn's original designs. This he succeeded in, to the extent of perfecting to the form we now are using the megascope.

Euler, Teiher, and Martin each made some slight alteration in the mechanism of the megascope (short account of an opaque solar microscope, by Martin, in Graphical Perspective.)

Again several years of obscurity follow in the history of our instrument. In 1770 Dr. Hill published a treatise in which he endeavored to explain the construction of timber by the microscope. This revived the instrument. At same time, 1770, the elder Adams, contrived an instrument for cutting sections of wood. This was afterwards improved by Mr. Cumming. Dr. Hill and Mr. Custance now endeavored to bring back the microscope to the old standard and succeeded. Mr. Custance was unrivaled in his dexterity in preparing, and accuracy in cutting thin transverse sections of wood.

Up to this time, 1772, the highest magnifying glasses for microscopes were made in Naples in 1765, by T Di Torre in globular form. One of the four sent to the Royal Society was missing when they were given to Dr. Baker for examination. The largest of these left was $\frac{1}{36}''$ in diameter, and was said to magnify 640 x, the second the size of 1 Paris point, or $\frac{1}{72}''$, and the third ½ Paris point or $\frac{1}{144}''$, and magnified 2560 x. (See report in Phila. Transactions, vol. 56, p. 67). With that which magnified the least, he was unable to see any object with satisfaction and concludes his account by expressing a hope that he had not injured his eyesight and states that anyone not used to microscopical investigation he fully believes would have been blinded by the testing of them.

In 1753 this same Dr. Baker writes that "the cumbersome and inconvenient double microscope of Hooke and Marshal, were many years ago reduced to a manageable size, improved in their structure, supplied with an easy way of enlightening objects by a speculum underneath and in many other ways rendered agreeable to the curi-

ous by Mr. Culpepper, and Mr. Scarlet." Notwithstanding the decided improvements made by these men, by way of reducing in size, etc., the instrument still did not suit Dr. Baker's idea of a good working stand. So in 1743 in speaking to Mr. Cuff, he mentioned the inconvenience of the legs about the stage, of pulling the tube up and in focussing and the absence of a good opaque illuminator. The result was a microscope by Cuff with stage free from legs, applied a fine threaded screw for delicate focussing and added a concave speculum for opaque objects, he does not state in what particular this latter differs from Leuwenhœk or Lieberkuhn. This is the first mention we have of screw adjustment in compound microscope, and the introduction of the idea of moving of the entire body by the fine adjustment.

1747. Mr. Cuff devised a micrometer for this instrument consisting of a net-work of silver wires, meshes of which were $\frac{1}{50}''$ placed in focus of ocular, which in connection with stage micrometer gave all necessary measurements. While speaking of Dr. Baker, I feel constrained to append a paragraph from his "Microscope made easy," although it may not be pertinent to the subject.

Mr. Baker gives some very good advice that should be reiterated in all text books of the present day. "Beware of determining and declaring your opinion on an object too suddenly, for imagination presently gets the start of judgment, and makes people believe they see things which better observers will convince them could not possibly be seen. Therefore assert nothing till after repeated experiments and examinations in all lights and all positions.

When using microscopes shake off all prejudice and opinion. Remember that truth is the matter you are in search of, and if you are mistaken let no vanity seduce you to persist in your mistake. Pass no judgment on things out of their natural state. Don't use any higher glass than is necessary to distinctly see your object.

THE MICROSCOPE AND MEDICINE.*

BY GEO. E. FELL, M. D., BUFFALO, N. Y.

A CURSORY examination of the pages of several of our American medical journals revealed the fact, that very little space was devoted to the microscope and its value in medical research. One

* Read before the Buffalo Medical and Surgical Association, September, 1882.

of these journals, published during the last ten years, had but five or six references to these subjects in its first twenty volumes. Not an original article, by an American physician, or more than one, pertaining to microscopy graced the pages of these numbers. While the works of foreign investigators, and even some of our American microscopists, were highly commended by the editorial department of this journal, its pages revealed the noticeable fact that little or absolutely none of this work could be credited to our *home* physicians. This criticism would justly apply to the *majority* of the medical journals throughout our land.

Our medical schools, or the great majority of them, at least, do not profess to teach anything regarding the technology of microscopic investigations. Practitioners are sent out into the world, *suitably qualified* it *may* be to practice medicine, but many not knowing the difference between an eye-piece and an objective ; totally unfit, so far as their medical education qualifies them, to use the microscope in the examination of the simplest object ; knowing veritably nothing regarding the instrument which has done more to advance the science of medicine than any other in the long category of instrumental accessories. While reasonable persons will admit that "knowledge is power," at least, "in the long run" it appears that many of our leading medical schools are controlled by the sentiment that microscopical knowledge does not enhance the physician's skill. Without a knowledge of histology, pathology, the normal and abnormal secretions of the body, as revealed by the microscope, he is as fully—yea, according to *many*, better—qualified to practice medicine than if he possessed this knowledge.

†The editor of one of our microscopic journals makes the statement that "as a matter of fact, physicians in general are utterly incapable of using the microscope in their practice. They cannot tell uric acid from triple phosphate, tube casts from cotton fibres, cancerous from normal cells, or a starch grain from a blood corpuscle. Does this seem incredible ? What shall be said of the physician who bought a fine immersion lens and returned it as worthless because he immersed it by filling the back with water and screwing it on the stand, or of the other one who tried to examine a lump of coal with a one-twelfth inch objective." What will we say of the

† Am. Mo. Microscopical Jour., April, 1882.

prominent practitioner in the southern tier of this state, who characterized the leucocyte as a myth, and who undoubtedly believed, so far as *his* practice was concerned, that all the rest of the revelations of the microscope were of the same character. That this condition of ignorance concerning the use of the microscope prevails to a great extent among the medical fraternity of our country, I believe few will question. That it is to be deplored, no thoughtful practitioner will deny.

How can it be otherwise, when it is possible to come across prominent physicians, who, graduating from respectable colleges within the last ten years, can say, that during their whole medical course they *never saw* a microscope.‡

It would appear that the revelations already made by this wonderful instrument, the progress in medical science credited to its use, would håve produced a different state of affairs.

It will be generally conceded that the value of the microscope is directly proportionate to the experience of the practitioner in its use, and a knowledge of histology and pathology necessary to its intelligent application in medicine. On this account the want of early training in these branches unquestionably deters many of the active practitioners of the day from giving any attention to these subjects. In the midst of an active practice, it is quite improbable that time will be found to take up a new occupation, and, as considered by many of the older physicians, one of questionable value.

While many effective arguments may be deduced to account for this lack of interest in scientific pursuits among the great mass of the profession, we cannot disabuse our mind of the idea that our medical colleges are responsible for it to a great extent. Professor Chas. H. Stowell, in his work on "Microscopical Diagnosis," says: "I hold the great majority of the medical colleges of this country directly responsible for the lack of this love for scientific research. They seek to please the student by prejudicing him against the scientific investigation of disease, and the students become practitioners before they are aware of their ignorance of matters that should have been familiar to them during the term of their pupilage. * * * But to the coming physician must we, as micros-

‡ I have been criticised for uttering these remarks, as calculated to injure the profession in the eyes of the laity. I have not yet in my brief experience known truthful statements to have an ill effect, but rather the opposite. If they are overdrawn, I trust some interested friend may demonstrate such to be the case.—[Author.]

copists, look for a solution of the more exact nature of disease and the more effective methods for its prevention and cure."

As to the value of the microscope as an aid in medical practice, we can find many satisfactory references. One of the ablest physicians* of this city (Buffalo) certifies in the following terms to its value:

"A physician must either be himself a microscopist, or must have almost daily recourse to one, for the necessary information to practice his profession correctly and conscientiously, not to say successfully. What the microscope has done and is doing for medicine can only be alluded to. By it alone we observe the minute homogeneous and wonderful processes by which the human body is evolved from a simple cell to the complete structure we call man. By its information we recognize diseases as local and parasitic, which for ages have been considered constitutional. By it, the various secretions and excretions of the body are examined, and it alone often determines whether important organs are functionally or structurally disordered. * * * * In chemistry by determining form, it often enables the examiner to predict probable properties. These things and many others the microscope has done for medical science. How much more it is difficult to surmise."

Dr. J. G. Richardson, of Philadelphia, in his hand-book of microscopy, estimates that at least one-half of the cases of disease which physicians are called to treat would have some light thrown upon their nature by a careful examination of the urine, blood, sputum, etc., with the microscope. This estimate, I am inclined to think, is too high.

The editor of the Buffalo *Medical and Surgical Journal*, in a review, states that the study of disease by aid of the microscope has come to be one of the established methods employed at the present time and it is an evidence of progress, etc.

Many more utterances of similar import to establish the value of the microscope in practical medicine might be advanced. It may be urged, however, that these citations would carry more weight if of a more specific nature. Dr. Robert Todd in his "Clinical Lectures on Certain Diseases of the Urinary Organs," indicates in the following terms the applicability of the microscope in renal com-

*Proceedings American Society of Microscopists. Buffalo Meeting. Address of welcome. Prof. Thos. F. Rochester, page 19.

plaints. He requests his students to look through the several microscopes arranged on the table. Upon one instrument was seen epithelial cells, such as are often met with in the acute form of renal dropsy; as in that which follows scarlet fever, and in that which sometimes follows exposure to wet and cold. In another was seen granular casts, with a few waxy casts, such as are generally found in urine in that form of chronic renal disease which ultimately produces wasting and shrinkage of the kidneys. Under two microscopes were tube casts which occur in urine in those cases of that form of chronic disease which tends to the permanent enlargement of the kidneys, rendering them either fatty or waxy, viz., fatty or waxy casts. Then again were seen tube casts which may occur in urine when severe hemorrhage takes place in the kidneys, and so on. In another lecture he says: "Further aid in the diagnosis between renal and vesical hemorrhage may be obtained by aid of the microscope. If the blood comes from the bladder we may see more or less of vesical epithelium mixed with the blood particles. This form of epithelium is flat, scaly and sufficiently easy distinguishable from that of the kidney, which would be more likely to be present when the hemorrhage originates in that organ. The renal epithelium being more or less globular and frequently accompanied by and entangled in small casts of the uriniferous tubes. When either kidney is the source of the blood we often find under the microscope casts of the uriniferous tubes, formed of coagulated blood, blood casts, as they have been termed."

Speaking of pus in the urine, after explaining the manner by which it may be detected by ocular and chemical means, he adds: For an additional and unequivocal test of pus you must look to its physical condition. With the microscope the pus corpuscle is readily recognized. "If a specimen of urine contain albumen, that substance may be derived from the liquor puris and may therefore be indicative of the presence of pus, or it may be due to the escape of serum only, as occurs in the various forms of chronic renal disease. This point may be at once settled as regards the presence of pus by examining a drop of the turbid urine under the microscope, when we shall not fail to recognize the pus if this product be present in the urine." And I might add the preparation is not too old. This use of the microscope in detecting the pus corpuscle alone is so far reaching in its value as to warrant the

statement that it alone furnishes sufficient reason for the teaching of microscopic technology in every medical college throughout the land. Roberts in his work on urinary and kidney diseases published some fifteen years ago, in speaking of the "clinical significance of renal epithelium and tube casts states:" "That the study of their various forms and appearances furnish information of great weight in the diagnosis and prognosis of the different stages and different types of renal or kidney degeneration."

If space permitted, it could be further shown that the microscope is of considerable value as an aid in ordinary practice. Numerous instances are recorded in which it has furnished information obtainable by no other means. It would be superfluous to cite cases even if our space permitted. The books are plentifully supplied with them, and but few intelligent practitioners who use the microscope, but can give instances of its value in their practice. However, I must say here that the usual hasty, spasmodic observations which are so often made with the instrument, are generally of little value in indicating the course of a disease. Systematic observations, covering a longer or shorter period, in many instances commend themselves to the reasoning practitioner.

The ridiculing of microscopic work, which is often noticed, by many would-be savants, is generally uncalled for, and has in numerous instances reflected on the reputations of these "wiseacres." It may be that the dilettanteism so frequently associated with the use of the microscope, is the cause of the general feeling of distrust which exists in certain circles regarding the value of microscopical investigation. This, coupled with the ebulition of latent jealousy which is known to often exist, and sometimes appears, between workers in different fields of science, has in numerous instances caused remarks derogatory to the results of microscopic enquiry.

* Dr. Lionel S. Beale relates an instance where a royal commission "The Cattle Plague Commissioners," expressed the opinion that the poison of that highly contagious malady was probably matter of a kind which is and always wiil be undiscoverable by the microscope and that chemistry ere long, or words to that effect, would probably solve the problem. Dr. Beale adds that "at the very time these sentences were written the poisonous matter had been made

*See "Diseased Germs" by Lionel S. Beale, p. 3-4.

out with the microscope, and the contagious material of more than one contagious malady had actually figured in the report which he there criticised." Notwithstanding the ridiculing by † J. Milner Fothergill of the great discovery by Dr. Rudolph Koch of the specific tubercular bacterium, such men as Prof. Tyndall are reported as placing it among the greatest discoveries of science. It is unfortunate that this subject which opens up such great hopes for the future of microscopic science has not been brought before your society, and the interesting experiments by which these specific bacteria were singled out made known to you. It had been my intention to detail to-night the methods by which Dr. Koch arrived at the results, which have somewhat startled the medical world, but time will not now permit.

My purpose has been to show that in and around the use of the microscope there exists most important reasons why our medical schools which have not already done so, should add this subject to their curriculum at the earliest moment. But while urging this step it would be well to convince my readers that these views are not entirely chimerical, as the advanced schools enable me to show. Before graduating from the medical college at Ann Arbor, University of Michigan, each student is obliged to pass a satisfactory examination in Histology and Microscopy and complete a course of practical work in the "Histological laboratory." When the student enters the Histological laboratory he is supposed to have a theoretical knowledge of the structure of tissues and of the use of the microscope obtained from the lectures. One afternoon of each week is devoted to the microscope, each student having the use of an instrument to himself. During the term he has fifteen lessons. Each afternoon opens with a quiz upon the last lesson and with a full explanation of the afternoon's work. The student then endeavors to carry out the directions of his instructor. In these lessons the following subjects are considered: Fibres, dust, starch, etc., blood, bone, cartilage, yellow elastic, white fibrous tissue, muscle, stomach, intestine, liver, kidney, spinal cord, brain and a few others.

Two hundred and ninety students took this required course last year. Some six thousand specimens were prepared and mounted by these students, all in a more or less creditable manner. In addi-

†Medical Record, Aug. 26, 1882, p. 252.

tion to this, ample provision is made for the use of the microscope in urinary analysis, a course of twelve weeks being required in this department and some forty microscopes being in daily use.

Prof. Charles H. Stowell, of the University of Michigan, to whom I am indebted for these facts, states that, but a small percentage of their graduates, owing to lack of funds, purchase microscopes before leaving, but as soon as they get settled they are anxious for an instrument. Encouraging letters certifying to the value of the microscope are frequently received from the graduates of this college. Since the connection of Professor Stowell with the University over seventy-five compound microscopes have been added to its laboratories, and over one hundred fine instruments are now counted as the property of the University. Of these, sixty are for the use of the medical students. For any intelligent person to claim that this course of study would be other than beneficial to the student, that he would not be better qualified to practice medicine by reason of such a course, would be utterly ridiculous.

*Prof. Huxley, in an address before the International Medical Congress held in London, August, 1881, remarked that "The search for the explanation of diseased states in modified cell life, the discovery of the important part played by parasitic organisms in the etiology of disease; the elucidation of the action of the medicament by the methods of experimental physiology appear to me to be the greatest steps which have been made toward the establishment of medicine on a scientific basis." The microscope has been the progenitor of this work to a great extent; in fact it could never have been considered without it, and who will limit its work for the future.

Shall our schools and colleges prepare their graduates give them at least an opportunity to know what a microscope is, start them in a knowledge of its application to their needs in their responsible calling, fit them to undertake this work with the assurance of success, which early training alone in this great field will secure; or must we ever continue in original investigation with the microscope, as secondary to our European neighbors?

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*See Transactions International Medical Congress. Vol. 1, p. 101.

BOLDO LEAVES.

BY LOUISA REED STOWELL, M. S.

[FROM PART II OF "MICROSCOPICAL DIAGNOSIS."]

THE boldo leaves of commerce are gathered from the shrub or tree, Boldoa fragrans, which belongs to the natural order Monimiaceæ. This tree is a native of Chili, found growing luxuriantly on the hillsides of the central provinces and cultivated in gardens.

It is a tall, evergreen, diœcious shrub or tree, with verdant foliage, fifteen to twenty feet high—though some authors give the

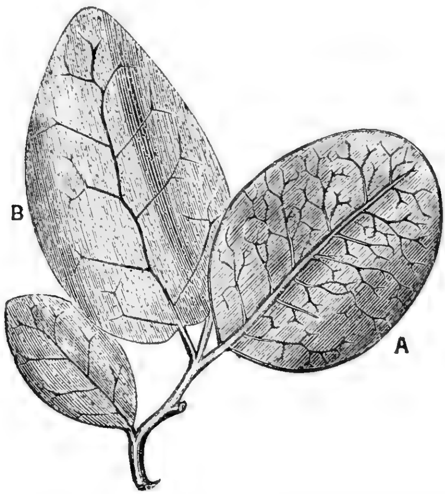

FIG. 1. Boldo Leaves.—A, lower surface. B, upper surface. Natural size.

height as only from five to six feet. The flowers are sweet-scented and of a greenish-yellow color. The fruit is small, about the size of a pea, sweet, aromatic and of a yellow color, which the natives used as a relish. It is used, though in small quantities, on account of the sensation of heat left in the mouth and the almost sickening sweetness of the fruit.

The leaves are opposite and borne on short petioles. They are oval, obtuse at both apex and base, coreaceous, strong and rough. The lower surface of the leaf, Fig. 1, *a*, is marked by prominent

midrib and veins, even the minute net-work of veins showing. The hairs add to the roughness of the lower surface. The upper surface, *b*, is more glossy and is tightly studded with small whitish projections. The dried leaves have a reddish-brown color with a fragrant odor and a refreshing aromatic taste. The lower surface of the leaf, when examined by the microscope, is found to be composed of the usual epidermic cells, see *a*, Fig. 2, quite uniform in size and appearance, while the stomates, *b*, are like those of other leaves. Each stomate, however, is surrounded by four epidermal cells. The hairs found on the under side of the leaf are not very numerous or uniform in size or appearance. They are multicellular and stellate with many points. The same are seen in Fig. 3 more highly magnified. They are not borne on a pedicle or stem, but directly from the lower epidermis, as seen at *a*, Fig. 4. The hairs found on the upper surface of the leaf are unicellular, long, slender,

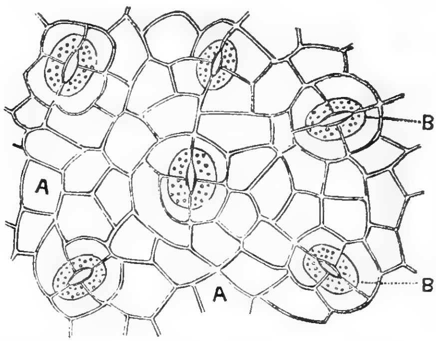

Fig. 2. Lower Epidermis and Stomates.—A, Epidermal Cells. B, Stomates. Magnified 350 Diameters.

and borne on an enlarged multicellular base, formed only of epidermal cells. These hairs are so easily brushed off the leaf that in the commercial leaf the projections are generally found without the accompanying hairs.

Fig. 4 represents a cross section of the leaf, showing the relations of the projections and hairs to the rest of the leaf. One can easily see here that the roughness of the upper surface is due only to the enlarged bases of the epidermal hairs. The portion of this section seen at *c* was more highly magnified and represented in Fig 5. The upper surface of the leaf is furnished with two rows of

FIG. 3. Epidermal Hairs.—From the Lower Surface of the Leaf. Magnified 200 Diameters.

thick walled epidermal cells, which is unusual, as leaves have generally only one row. Directly beneath these is found the usual row of elongated palisade cells, *b*, filled with chlorophyll. In a dried

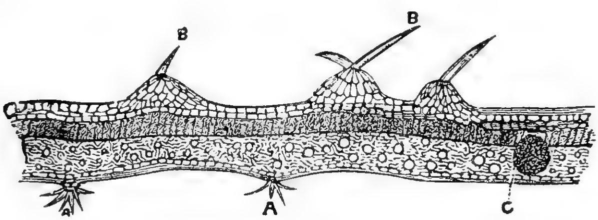

FIG. 4. Cross Section of Leaf.—a, Stellate Hairs on the Lower Surface. b, Unicellular Hairs on the Upper Surface. Magnified.

specimen the chlorophyll is of a yellowish-brown color. Forming the central part of the leaf are the loosely packed cells, called parenchyma, loaded with brown coloring matter and dead protoplasm.

The lower surface of the leaf is protected by a single row of thick-walled epidermal cells, similar to those of the upper surface. Numerous large glands *c* are found scattered through the loose parenchyma. In some of these are pendant cystoliths, *d*, others contain the essential properties of the boldo leaf, boldina, tannin, and aromatic resinous compounds. There are smaller oil cells, *c*,

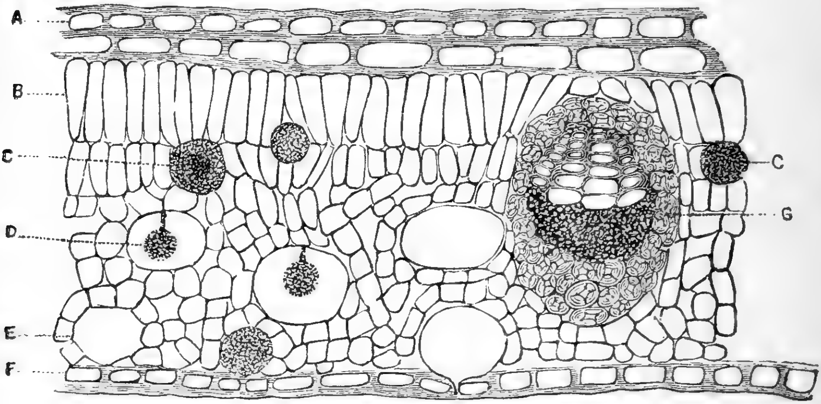

FIG. 5. Cross Section of Leaf.—a, Upper Epidermis. b, Palisade Cells. c, Oil Cells. d, Cystoliths. e, Glands. f, Lower Epidermis. g, Vascular Bundle. Magnified 350 Diameters.

scattered through the leaf, sometimes found even between the palisade cells and the upper epidermis; these are loaded with essential oil. At *g* is seen a cross section of one of the veins of the leaf.

Boldoa fragrans is recognized by both the French and the Germans as officinal.

Travelers inform us that it has been used by the natives of Chili from time immemorial. In 1870 the medical men of Chili first began to use it in their practice. Shortly after it was introduced into the United States. It is now recommended for use in liver troubles, in rheumatism, dyspepsia, ulceration, etc., while it is receiving some notice as a curative agent in yellow fever.

HOW TO PRESERVE URINARY DEPOSITS.

BY C. H. STOWELL, M. D.

(FROM PART I, MICROSCOPICAL DIAGNOSIS.)

URINARY deposits may be preserved in Canada balsam, in glycerine, in a one per cent. solution of carbolic acid, in equal parts of glycerine and camphor water, in a solution of naphtha and creasote, and in various other media.

The naphtha and creasote solution is of very general use. It is made as follows:

Creasote, - - - - - -	3 drachms.
Naphtha, - - - - - - -	6 ounces.
Distilled water, - - - -	64 ounces.
Prepared chalk, - - - -	a sufficient quantity.

Mix the naphtha and creasote together, then add as much of the chalk as may be necessary to make a thin, pulpy mass; the water is now added gradually, the whole being well rubbed together in a mortar. One or two small pieces of camphor are added and the whole mixture is allowed to stand two or three weeks in a closely covered vessel, being frequently stirred. At the expiration of this time the clear fluid is poured off, and filtered if necessary, and preserved in well corked bottles.

When any urinary deposit is to be mounted in a fluid the following method should be carried out. The sediment is allowed to settle in the test-tube, when as much as possible of the urine is drawn off from it by a syphon. A quantity of the preservative medium, equal in bulk to the contents of the tube, is added to the sediment and the mixture well shaken; this is allowed to rest until the sediment settles to the bottom of the tube again. The preservative fluid is now drawn off, as was the urine, and a fresh quantity of the fluid added. By so doing the deposit is thoroughly impregnated with the preservative medium.

Casts are preserved very well in the naphtha and creasote solution. The very pale casts show much better by coloring them with the carmine solution.

Phosphate of lime is preserved in the naphtha and creasote fluid. The crystals of the triple phosphate are preserved the best

in water to which a little chloride of ammonium has been added. Cystine is preserved either in glycerine jelly or in the naphtha and creasote solution.

The urates and uric acid are preserved in the naphtha and creasote solution also. Crystals of uric acid show nicely when mounted in Canada balsam. To mount them in balsam, they must first be thoroughly washed with distilled water and then carefully dried. They are dried the best under a bell jar over sulphuric acid. When dry, a drop of oil of turpentine is added, and this is allowed to nearly evaporate when a drop of Canada balsam is added and the slide gently warmed. Care must be exercised here that the heat be slight, otherwise the crystals will be cracked in every direction. These crystals show very nicely when mounted in this way. Crystals of oxalate of lime are best preserved in the naphtha and creasote solution.

Many of the crystals obtained from urine are preserved the best in a dry state. Such are urea, nitrate of urea, oxalate of urea, creatine, creatinine, and many others. These crystals are allowed to form upon the glass slide, when they are thoroughly dried under a bell jar over sulphuric acid. A shallow ring of white zinc can be placed around the crystals and the cover applied and hermetically sealed. In the great majority of cases the crystals obtained from urine are not preserved in their mother liquid.

MICROCOCCI.

BY J. M. ADAMS.

THE micrococci, the smallest of the *schigomycetes* or splitting cells, are among the very smallest of microscopic forms, and are generally passed over by microscopists because so minute and troublesome to examine. Being so near mere points, a correct measurement is most perplexing, as they range from $\frac{1}{25000}$ to $\frac{1}{50000}$ of an inch in diameter, or only about the width of the flagella of the larger bacteria, which many have never yet seen; however, they are handled much more easily than minute monads, as they are motionless. Some are oval, but most are round; nearly all are dark colored, yet some are quite transparent, if not wholly so, and may be often overlooked. They may be mistaken for

material broken up into infinitesimal fragments, except that they form chaplets or bead-like chains from their mode of growth by transverse division or forming zoogloca when at rest. They do not require decomposition of the substance for their growth, as with the bacteria, and do not have their primary object to help or hasten decomposition as with them, but may live in any material adapted for their growth, particularly vital or animal fluids. The blood-serum of living animals is a favorite place of resort; some cling about the red corpuscles, others fill and burst the white corpuscles, while others fill the serum so much as to disturb the circulation among the finer tissues and produce various effects peculiar with certain zymotic and contagious diseases. They precede the work of bacteria, or their work ceases where bacteria commence theirs, as they may work previous to and independent of decomposition. They form nitrogenous compounds in part, and finally produce poisonous effects. They generally will have their "run," as antiseptics can only check their growth in a limited measure at best, and like all parasitic growth, keep on till the material affords too little support for further growth, when the physical system assumes the mastery, particularly over the lesser malignant species, as in scarlatina, malaria, varioloid, etc.

Many species, however, are so destructive and absorbent of all the material substance, that they leave almost, if not incurable effects, as in glanders, syphilis, leprosy, etc. Their effects are so certain and invariable that, with their color, forms and symptoms produced, they can be safely classified into very many separate species—many more than Cohn and others have already classified.

Whatever may be their real object in nature is yet a mystery. They seem to live on or with the nitrogenous material principally, and die out when that has been peculiarly affected, and also die in pure water, in air, or by dispersion under unfavorable conditions. Whether they are for good or evil is a question, but no doubt they may have some good effect, not known; yet, being parasitic, their immediate or direct effect is always unfavorable. They most certainly puzzle the doctor, as well as the microscopist.

F. W. McAllister has just issued some new circulars of Gundlach's goods. He has some fine normal and pathological specimens.

THE PREPARATION OF CRYSTALS.

BY A. Y. MOORE, CLEVELAND, OHIO.

MANY salts can be crystallized from their solution upon a slide and mounted dry or in Canada balsam; but, in many cases, it will be found that the crystals gradually become altered. They become less brilliant, or sometimes completely dissolve.

For some time past I have resorted to a method, which—so far as I am informed—is new. In brief it is this:

A cell is made upon an ordinary slide with some cement upon which the salt solution has no solvent action. A cold, saturated solution is then made of the salt solution desired. The solution is then heated, so that it will dissolve still more of the salt.

The cell should then be filled with the warm solution and immediately sealed. Upon cooling the crystals will be deposited within the cell in a most beautiful manner, and their lustre is retained.

While filling and sealing the cell, the slide may be kept warm by placing it upon the turn table which has been previously heated, but care is required not to overheat it, which would soften the cell or cause an evaporation of the liquid.

Glycerine is an excellent medium for such salts as it will dissolve, and is easily sealed. I use quick-drying gold size as a cement for sealing such preparations, as it hardens quickly and holds well.

THE MICROSCOPE AMONG INFINITIES.

BY J. M. ADAMS.

IT is a question already brought up by those who make a specialty of the minutest forms of life, whether the microscope will be able to reveal them sufficiently to distinguish one from the other, independent of their effects.

The minute species of *micrococci*, being mere points, but which infuse the serous fluids in many diseases, although they are specifically different, as they produce certain identical and specific changes and effects, yet cannot be well distinguished from each other until the symptoms of the disease appear.

Many of the smaller *bacterian* forms differentiate to such a minute line or dot, that they fade out of sight, but from comparisons

with larger species, they must have their spores which are altogether invisible and their terminal or biflagellate cilia.

The smallest *monads* dwindle into nonentity nearly and are hardly distinguishable from each other, except from their movements produced by invisible flagella.

The mysterious motions of diatoms, although a quandary, may be from unobserved minute organs or organisms, finer than have yet been discovered, although possibly internal, yet after all, the cause is hidden from view.

The so-called "Brownian movement" may be caused in many cases when the material favors, by the jostling of unseen forms of life, although light, heat and electricity may also have their effects.

Particles of transparent and volatile substances, perfumes, gasses, etc., although invisible, are well known to be made up of scattered particles.

The various atomic arrangements in opaque substances cannot be seen or ever hoped to be seen, as no doubt a single atom or small cluster of atoms are unable to throw light enough by reflection or otherwise to appreciably affect the optic nerve—thus the limit of vision!

Whether the microscope can be supplemented by any instrument or modification, as the telescope is supplemented by the spectroscope (yet the microscope has also its spectroscope), or, perhaps, something higher than that, is a question finer than any one dare as yet to venture a prediction.

To plunge into and among these infinities, is rather a deep subject for the microscopist, but he will not stop short of his utmost endeavors to find out the ultimatum of human perception, at least, with every accessory that may be furnished.

HOW TO TURN OVER SMALL OBJECTS.

BY J. M. ADAMS.

A SIMPLE and convenient way of turning over small objects, as corpuscles, epithelium, diatoms, etc., in a liquid, is to half fill a live box and revolve the stage or hold the instrument so that it can be swayed out of level or from one side to another. In this way all sides can be easily and readily seen.

ROMEYN HITCHCOCK'S JOURNAL.

FRIEND STOWELL:

ABOUT a year ago, in the A. M. M. J., Prof. Hitchcock gave you a rather severe criticism, and not in a very fraternal spirit either.

After having read the criticism referred to I naturally supposed that anything of an unscientific nature could not gain admittance to the A. M. M. J. under any consideration.

Notwithstanding all this, however, we meet the "crowning glory" in the September issue, p. 177, in which a short conversation between one of our well known Rochester opticians and the daughter of a well known Philadelphia microscopist is given in detail.

Is that a "scientific" journal? Of course there is supposed to be a reason for printing such nonsense, but as that reason is not generally known to the public, it seems to me that such stuff is decidedly out of place in a scientific periodical.

Verily, the inhabitants of glass houses should not throw stones.

Very respectfully,

——. ————.

——. ————, Nov. 5, 1882.

The editors of this journal were recently elected honorary members of the Aurora Microscopical Club, of Aurora, Ill. This pleasant note came with the announcement: "It is hoped that the compliment will be received and accepted as a slight tribute of our respect for the high positions you have attained in the scientific world." This society recently elected the following officers for the coming year: President, Rev. R. D. Shepperd, D. D.; Vice-President, Chas. H. Qureau; Secretary, Dr. John E. Hurlbut; Treasurer, Arthur P. Vaughan, Esq.; Executive Committee, Dr. H. G. Gable, Prof. J. H. Freeman, Rev. Dr. Shepperd. Regular meetings are held the first Wednesday evening of every month.

Society Proceedings.

BUFFALO MICROSCOPICAL SOCIETY.

PROFESSOR KILLICOTT reported a number of rich discoveries made while at work near Petoskey, Mich., during the past summer. He found *ophrydium versatile* in great quantity, also the same in Niagara river. He reported finding also *Pleurococcus vulgaris, P. miniatus, and P. roseo percicinus.*

Henry Mills reported finding more sponge in the Niagara river, probably *Meyenia asperrima.*

Dr. Fell had found *melicerta ringens* in colonies on the shores of Niagara river. He also exhibited sections of gall stones, obtained from a patient.

Mrs. Dr. Moody exhibited specimens of shale containing spores of *Lycopodium.*

ELMIRA MICROSCOPICAL SOCIETY.

At a late meeting of the Elmira Microscopical Society, the Secretary, Dr. Thad. S. Up de Graff, showed a new *brachionus*, found in Elmira waters, and pronounced new by authorities in the study of the Entomostrica.

Description as follows:—Carapace testular, irregularly urceolated and scabrous on dorsal aspect. Five posterior horns or spines. Central one longest, straight and pointed. Lateral ones, two on each side, projecting from angles of the carapace, of nearly equal length, curved slightly inward—horn-shaped. Another curved horn (making six in all), projecting directly outward, from immediately in front of the eye. Foot absent. One scarlet, cervical eye. Two rotatory organs, connected by an irregular, ciliated brow. No spines or horns in front. Color of body, light yellow. In feeding, the creature revolves rapidly upon its antero-posterior axis. Length, $\frac{1}{100}$ of an inch, not including spines.

The Secretary named it the *Brachionus Gleasonii*, in honor of the President of the society. He then exhibited his new $1,600 microscope, made expressly for him in London, by R. & J. Beck, and pointed out its new features.

Editorial Department.

WE have concluded to offer the following premiums for new subscribers:

To any person remitting to us three dollars for three new subscribers we will send one copy of the journal free.

To any person remitting five dollars for five new subscribers we will send one copy of our "Manual of Histology."

To any person remitting seven dollars for seven new subscribers we will send one copy of our "Microscopical Diagnosis."

To any person remitting ten dollars for ten new subscribers we will send one copy of the "Histology" and one copy of the "Microscopical diagnosis."

To any person remitting twelve dollars for twelve new subscribers we will send one copy of "THE MICROSCOPE," one year, and one copy each of our "Manual of Histology" and "Microscopical Diagnosis."

Members of the above clubs can take advantage of clubbing rates with our books. Thus one may remit two dollars and twenty-five cents; get a copy of our "Histology," the journal for a year, and aid someone else in getting a copy. He would be regarded as paying one dollar for the journal in this case.

ANYBODY might have read our first advertising page in the October issue a dozen times and still remain ignorant where the Acme and Crouch microscopes could be purchased. The address of Queen was omitted by mistake. One of their new catalogues will show you that they are well supplied with goods, and no mistake about that.

PLEASE notice the change in the address of George A. Smith, agent for Hartnack Microscopes. These goods have a reputation not acquired in a day.

A FRIEND says that "McAllister's five dollar microtome is good enough for anybody."

DR. FELL'S paper has awakened some of the sleeping brothers and he has been "criticised." The cause will not suffer by it neither will Dr. Fell.

THE first official document from the office of the president of the American Society has reached us. It gives the list of new officers, and urges all members to keep alive to the interests of American Microscopy. We notice at the head of President McCalla's last letter that he had then written eighty-four official letters. Let us all do our share toward making the Chicago meeting a success.

MRS. STOWELL gives a paper before the "Michigan State Teachers Association," December 28th, on "The Microscope in our Public Schools."

HOW convenient it is! Webster, Klein and Smith are now easily handled. All because L. W. Noyes invented his ingenious holders. They are an ornament as well as great convenience. See advertising pages.

A LETTER from Mr. Walmsley bearing date of November 14, says that his article will "surely be ready for the February issue."

G. A. Vicker's method for killing and preserving insects: "Place a drop of the acid (pure crystallized with just sufficient water added to keep it fluid) on a slide and drop into it the living insect; it will be seen to struggle for a second or two, then the limbs, wings, and tongue become extended; it then becomes beautifully clear and transparent. The acid should now be drained away, a drop of balsam put on, the cover applied.—*Northern Microscopist.*

Dr. Klein has been testing the value of Pasteur's "vaccin charbonneaux" and declares it a failure. He also thinks the fluid dangerous, introducing the anthrax where it does not exist.

Items.

Powdered Ipecac has just been reported adulterated with powdered almonds and licorice.

Dr. Carl Seiler says that the bevel of the edge of section knives should be the same on the two sides.

"The numerous lamps of complicated structure are superfluous for histologists or for other purposes than resolving test objects." —M. Flesch.

By sending your name to Jas. W. Queen he will mail to you regularly his circulars of "Microscopical Novelties," provided you say you are interested in them.

Koch has demonstrated that spores of mould fungus are destroyed in an atmosphere of 230° to 240° F., inside of 1½ hours. Spores of bacillæ require 284° for over three hours.

Query! Is it possible that Romeyn Hitchcock does not love the American Society of Microscopists? "THE MICROSCOPE" regrets that it has appropriated all his affection to itself.

The "Buffalo Microscopical Club" takes the lead for neat "programs for the year." Papers all engaged up to next July.

HOW TO LABEL MICROSCOPIC SLIDES. Instead of one thin paper label at one end, use two made of slips of thick card 1 in. by ½ to ¾ in.—they can then be placed one against the other without the glass of one slide touching the cover of the next, and hence there is no need of a cabinet, as any box of a suitable size will do.— —*Science Gossip.*

Dr. Heitzmann is "a large-hearted, genial gentleman, very courteous and enthusiastic. All dentists should meet him." So says one of his deluded victims, a Dr. Davenport. See *New England Journal of Dentistry* for October.

EMBEDDING MIXTURE.—

Solid paraffin, - - -	3 parts.
Cocoa butter, - - - -	1 part.
Hog's lard, - - - - -	3 parts.

Rather soft, good for cold weather.

IODINE GREEN.—Iodine green crystals one tenth grain to 35 grains distilled water. It stains quickly and alcohol does not remove the color at once. It stains chromic acid preparations well.

PERENYI'S HARDENING FLUID.—

Nitric acid, (10 per cent.) - - - -	4 parts.
Alcohol, - - - - - - - - -	3 parts.
Chromic acid, (.5 per cent.) - - -	3 parts.

Place ova in here for four or five hours, then twenty-four hours in 70 per cent. alcohol, then in stronger and lastly in absolute alcohol. Surprising results are claimed for this in embryological work.

For mounting mosses and hepaticæ, M. Delonge recommends glycerine-gelatine.

FINISHING VARNISHES.—*The vehicle.*

Gum dammar, - - -	3 ounces.
Gum mastic, - - - -	1 ounce.
Benzol, - - - -	6 ounces.

The colors.

White, - - - -	oxide of zinc.
Blue, - - - - -	ultramarine.
Red, - - - -	carmine.
Black, - - - - -	lamp black.
Green, - - - -	verdigris.
Yellow, - - - - -	chrome-yellow.

Triturate the color with the vehicle in a mortar.

DAVIS.

CAMPHOR WATER.—

Distilled water, - - -	1 quart.
Tincture camphor, - - -	1 drachm.

Mix well. Use only the clear liquid.

Prof. Richardson, of Philadelphia, shows glaring errors in Dr. Cutter's work on "cereal foods under the microscope," published in *Gaillard's Medical Weekly.* He places Dr. Cutter under too strong a scientific illumination.

Harden dental pulp in a one per cent. aqueous solution of chromic acid, separated from the dentine; or take fresh pulp from the extracted tooth, stain with carmine, harden in glycerine to which was added one per cent. acetic acid. In three to six months sections could be cut with a keen razor.—Editor of *New England Journal of Dentistry.*

"Among the curiosities recently exhibited by a London Society was the microscope of half a century ago, weighing 125 pounds, and the "Midget," a modern invention, weighing only a few ounces." So says a newspaper.

Mr. W. K. Kent presented a new live cage for dry objects before the Buffalo club. It consists of a wooden slide, with a cover glass set near one end, and a spring clamp near the middle. In other half slides of different thickness cover glasses were inserted, and these when placed under the spring-clamp, which held them firmly in place, made convenient cells. The advantage in its use was its simplicity and cheapness. Any one could make them.

CRYSTALS IN PLANTS.—"We may say that almost all plant-crystals are of calcium oxalate. There are crystals of calcium phosphate and tartrate, of potassium oxalate, etc.; but they are distinguished by their solubility in water or in acetic acid. All plant crystals insoluble in water and acetic acid, and soluble in mineral acids, are composed of calcium oxalate. There are no crystals of calcium carbonate or sulphate in plants."—Dr. A. Poli.

TRICHINÆ IN ADIPOSE TISSUE.—Contrary to the commonly accepted idea that trichinæ inhabit only muscular tissue, the *Lancet* says that Chatin has found them in adipose tissue. That he did not mistake them, is evidenced by the coexistence of the same parasite in the muscular tissue of the same subject. Experiments proved that animals fed with trichinous fat exhibited no indications of trichinosis, while others fed with the flesh from the same infected animal quickly suffered and died with symptoms of intestinal trichinosis; although further observations on the comparative innocuity of the fat must be made before the fact can be regarded as of hygienic importance. The practical value of the discovery at present seems to be that the fat, as well as the flesh, of suspected animals should be examined.—*Medical and Surgical Reporter.*

Reviews.

A Treatise on the Science and Practice of Medicine, or the Pathology and Therapeutics of Internal Diseases. By Alonzo B. Palmer, M. D., LL. D., Professor of Pathology and Practice of Medicine, and of Clinical Medicine in the University of Michigan. Volume I. General Pathology, general diseases, diseases of the organs of digestion and assimilation. New York: G. P. Putnam's Sons.

Ten years ago we were among the students, listening to the teachings of Professor Palmer. Our classmates presented to each other the advantages to be derived from having a work like the above for a text-book while in college, and for a work of reference when we should become engaged in active practice. When students we regarded our teacher as a thorough and earnest worker, a clear thinker, well posted on the literature of his department. As practitioners we have found him an accurate diagnostician and a successful prescriber. What then should we expect to find in this work?

Clear diagnosis, full pathology, and accurate directions for treatment. In all these Professor Palmer has not disappointed his pupils. It is a work on pathology for the critical pathologist. It is a work on practice for the busy practitioner.

As the only comprehensive work written by a western practitioner, it will prove of the utmost value to our western medical men.

Years of hard labor, both at home and abroad, in country, city and hospital practice, aided by a ripe judgment, have enabled Professor Palmer to give us a work that is as precise as it will be permanent.

History of Womans Suffrage. Edited by Elizabeth Cady Stanton, Susan B. Anthony, Matilda Joslyn Gage. Complete in three octavo volumes. Cloth, $5.00, sheep $6.50. Fowler and Wells, Publishers, N. Y. City. Illustrated with steel engravings.

Volume one consists of eight hundred and seventy-five pages well illustrated with steel engravings. It gives a history of the woman's suffrage movement from 1848 to 1861.

By reading a few pages only one becomes convinced that this is a work of high value and merit. It deals with facts in a racy and interesting way. It presents many phases of the anti-slavery movement not recorded elsewhere.

The editors have exhibited especial qualifications for their important work. Open the book anywhere and you become at once deeply interested. It is a work that honors alike the cause and the editors.

Traite D'Hygiene, Publique et privée. Par A. Bouchardat, Professor of Hygiene in the Faculty of Medicine, Paris. Second edition, 8 vo., pp. 1300. 1883. Illustrated.

Man is considered individually and collectively. The atmosphere, aliments, excretions, sensations, etc., are all thoroughly discussed.

Moral, general and international hygiene are taken up in turn. An exhaustive treatise on this subject.

The Physician Himself and what he should add to his Scientific Acquirements. By D. W. Cathell, M. D. Second edition, 8 vo., pp. 203. Cushings and Bailey 262 West Baltimore St., Baltimore, Md. 1882. $1.25.

This edition differs from the first in being divided into chapters and furnished with a full index. It consists of two hundred pages of solid advice to professional men. Every young physician especially should read the work until he has about committed it to memory. How we wish some old doctors we know would read it too! The precepts of Dr. Cathell's book, if carried out, will cause many dollars to come to the "new doctor."

Every physician, every one, should purchase a copy and read it.

Sea Mosses. By A. B. Hervey, A. M. Illustrated with twenty full page engravings in color, from photographs of actual specimens. Small 8 vo. pp. 281. 1882. Boston: S. E. Cassino.

If anyone should be contemplating a trip to the seaside this book should form a part of the outfit. If obliged to stay at home, then send for the book and get some idea what summer life by the sea-side might be.

The plates are simply beautiful.

In outline and color they represent real plants, hence they must be beautiful.

A helpful guide to the botanist, a fine book for the library. "Who does not love the sea! For every mood of the mind, with some one of its thousand voices it speaks some answering tone."

New Commercial Plants and Drugs, No. 6. By Thos. Christy, F. L. S. 1882. London: 155 Fenchurch St., E. C.

As one takes in hand this thick pamphlet of upwards of one hundred pages, he notices at once the varieties of paper employed in it and is in doubt whether it is one of the fanciful variegated books sometimes found in the book stores or the result of carelessness on the part of the printer. An examination of the pages, how-

ever, shows that the half dozen weights and colors of paper are samples of manufacture from wood-pulp by the Ekman patent process. They are certainly all fine specimens of paper.

The first fifty pages of the pamphlet are devoted to an account of vegetable fibers suitable for paper or fabrics. The six colored plates, though rather rude as works of art, are sufficient to give the reader a clear idea of the microscopical characteristics of the fibers illustrated. They are from drawings of M. Vétillart, of Paris, who has also furnished a part of the text. The remainder of the book is devoted to notes on plants and accounts of new drugs.

While some parts of the book strike one as a case of special pleading for the patent process above alluded to, yet it contains besides much information of great value to the students of fibers and pharmacal botany. It is a valuable contribution to our knowledge in these branches, and no student, of fibers especially, can afford to be without it. M. W. H.

NITRO-GLYCERINE IN ANGINA PECTORIS. By William Murrell, M. D., Lecturer on Materia Medica at Westminster Hospital. etc. Small octavo, pp. 78, heavy toned paper, cloth bound, embossed in gold, $1.25. Geo. S. Davis, Detroit.

The history of this new drug is given first, followed by a description of its effects upon thirty-five people whom the author induced to try the drug. He afterward administered it in hundreds of cases and always happily so in angina pectoris. He advises patients liable to attacks of this disease to carry pills or tablets of the nitro-glycerine with them. The remedy is perfectly safe so far as any "explosion" is concerned.

The work is illustrated with sphygmographic tracings and is of permanent value in proving the place of this new drug in our Materia Medica and Therapeutics.

PHTHISIS PULMONALIS. By G. N. Brigham, M. D., Grand Rapids, Mich. 8 vo., pp. 244.

The history, causes, symptoms, etc., of this disease are well brought out, but when it comes to the treatment what shall we say! For it is of the "little pill" persuasion.

To all who have "faith" this work will be of value.

INJURIOUS INSECTS OF THE FARM AND GARDEN. By Mary Treat. Small 8 vo., pp. 288. Figures 163. 1882. Orange Judd Company, 751 Broadway, New York City.

The author has an established reputation as an honest and careful investigator, hence a work of this kind brings with it a feeling that what it says is without doubt true.

It gives the life history of our most common insects in such a way that it will add greatly to a popular knowledge on this most important branch of natural history.

THE DRUGGISTS READY REFERENCE FOR 1882. By Morrison, Plummer & Co., Chicago. Pp. 554.

REPORT OF THE SUPERINTENDENT OF PUBLIC INSTRUCTION, MICHIGAN. Pp. 300. 1881. By Varnum B. Cochran, Superintendent of Public Instruction.

YEAR-BOOK OF PHARMACY AND TRANSACTIONS OF THE BRITISH PHARMACY CONFERENCE FOR 1881. 8 vo., pp. 560. Price, 10 shillings. Address "The Secretary," 17 Bloomsburg Square, London, W. C.

A valuable collection of new preparations, processes and formulæ, together with papers treating of various pharmaceutical researches.

THE editor and publisher of one of our exchanges is also engaged in running a second-hand apparatus store. It is interesting to read the prices attached to these old goods, for which "the publisher does not hold himself responsible * * *."

The person wishing to sell must pay ten cents per line for each insertion, and a commission of ten per cent. on all sales.

But the buyer!

So far as we know we can sell any of the goods offered in said published list, and warranted direct from the manufacturers for the same price as offered by said publisher for second-hand goods.

For instance a 1/8 in. Beck is offered at $16.00. We will duplicate it NEW for $16.00.

A 1/10 inch Beck, immersion adj., is offered at $40. We will duplicate it NEW for $40.

An erector of Zentmayer's, for $5.00. We will furnish NEW for $5.00.

A 3 inch "Spencer" is offered for $4.80. We will duplicate it NEW for $4.80.

A 1/2 inch of Bausch and Lomb is offered at $7.00. We will duplicate it NEW for $7.00.

We do not desire to go into this business, but if any of our friends desire NEW goods at the same price that second-handed ones are offered we will accommodate them so far as indicated above.

We will also hold ourselves responsible for the goods as represented.

THE MICROSCOPE

AND ITS RELATION TO

MEDICINE AND PHARMACY.

VOL. II. WHOLE NO. 12 } Ann Arbor, February, 1883. No. 6

CONTENTS.

Original Communications.

THE USE OF THE MICROSCOPE IN GEOLOGY.

BY ALEXANDER WINCHELL, LL. D., PROFESSOR OF GEOLOGY AND PALÆONTOLOGY, UNIVERSITY OF MICHIGAN.

A PRETTY regular perusal of the literature of microscopy has led me to notice that, in America especially, the attention of those who use the microscope is directed chiefly to the forms and structures of the living organism. Of course, the study of fossil *Diatomaceæ* constitutes a conspicuous exception. It would be well, it seems to me, if a larger number of observers would interest themselves in the subjects of microscopic inquiry presented by geology. Palæontology and lithology both offer extremely inviting fields. They are inviting both from the intrinsic interest and importance of the investigations, and from the extraordinary beauty of many of the preparations. It is true that the requisite appliances, labor and dexterity for the production of good specimens, may explain much of the neglect of geology in microscopical manipulations and studies. But I do not consider these hindrances serious, and I therefore take the liberty to offer a few suggestions.

The microscopist interested in the study of organic structures will find many of our fossil corals extremely available, and exquisitely delicate, in their minute details. The whole order of cup-corals (*Rugosa*) is well represented in the west, and thin transverse sections reveal their internal structures with a clearness not dreamed of ten years ago by palæontological investigators. No other method, in fact, suffices for the demands of modern investigation. One of the commonest and most beautiful of the cup-corals is *Heliophyllum Halli*, found in the Hamilton group from central New York to Michigan. The cliffs at Petoskey afford it abundantly, but some Ontario localities yield handsomer and more numerous specimens, especially Widder (on the railway) and the creeks through the township of Bousanquet. Another exquisite form is *Acervularia Davidsoni*, found in extreme abundance at Petoskey and in the region about Thunder Bay, but known from Ontario to Iowa City. Petoskey and the Thunder Bay region yield also three genera of corals belonging to the family of *Stromatoporidæ*. Of these, *Cœnostroma* and *Idiostroma* were first described from Michigan, and the former affords, in thin sections, very interesting specimens. All these admit of only a very low power.

But the forms lately embraced in the genus *Monticulipora* (mostly *Chætetes lycoperdon* of the older writers), are so minute in their structure as to render the microscope indispensable. These are chiefly Lower Silurian corals, and occur in extreme abundance in southern Ohio, in central Kentucky and central Tennessee. They have recently been studied with much detail by Professor Nicholson, formerly of Toronto, now of St. Andrews, Scotland. Mr. U. P. James, of Cincinnati, is also engaged on them, and Mr. W. P. Cleveland, of Higginsport, Ohio, prepares beautiful specimens. The minute structures of fossil corals in general, are under investigation by Prof. James Hall, of Albany, who has had prepared a large number of marvelously fine specimens.

A different class of subjects is furnished by *Eozoön Canadense*, an object whose organic nature is not even yet completely settled. Dr. Dawson, of Montreal, has labored extensively on its minute structure and systematic relations, and has written a charming little volume, "The Dawn of Life," on this subject. It has also engaged the attention of the renowned microscopist, Dr. W. B. Carpenter.

Still another direction in which the American microscopist may

profitably employ his instrument is in the minute structure of molluscan shells, especially those of fossil *Brachiopoda*. Here, also, Dr. Carpenter has been conspicuous; but no American observer has given this field of investigation as much attention as the late Mr. F. B. Meek, who succeeded in closing the evidence, by this means, as to the distinctness of two genera long in dispute. The investigation of fossil structures by means of thin sections, is an inviting field just opening for the entrance of patient and thorough students.

Quite as recent is the microscopic method of lithographical study. Lasaulx, Rosenbusch, Zirkel, and others in the old world, have shown that thin sections of crystalline rocks reveal their mineral composition, and present at the same time preparations of unique beauty, well suited for the use of the polarizer. Professor Julien, of New York, has engaged extensively in the productions of thin sections, using a somewhat costly lathe of his own construction. Prof. Julien . applied this method to the rocks of Michigan; Mr. Hawes to those of New Hampshire, and N. H. Winchell, to those of Minnesota. Dr. Rominger, of Ann Arbor, however, produces equally five specimens by hand, with no accessories but a copper plate and one quality of emery. He devotes about an hour to the completion of a specimen. An enterprising and patient worker may, therefore, obtain all the requisite sections of rocks and fossils, whether calcareous or silicious, without any costly or complicated appliances.

Should this subject seem to possess sufficient interest, the appliances, manipulations and principal published helps may be brought into notice on some future occasion.

SOME HINTS ON THE PREPARATION AND MOUNTING OF MICROSCOPIC OBJECTS.

BY W. H. WALMSLEY.

FOURTH PAPER.

HAVING thus far in our practical work of preparing various objects for examination under our microscopes and for permanently preserving the same, confined ourselves to balsam and dry mounts, it seems proper for us to make a beginning, at least, in fluid mountings, which, after all, are the most generally useful and valuable. So many delicate and beautiful structures are com-

pletely obliterated when placed in balsam or other media of a high refractive index, that it becomes necessary to find others, which, at the same time, will properly preserve the tissues and best exhibit their structures. I do not propose to give any formulæ for the preparation of these (numerous excellent ones for all purposes may be found in the various manuals on the microscope by different eminent writers), but shall confine my paper to practical hints, as to the best methods of using the fluids and rendering the mounts *permanent.*

For this has been the stumbling block in the way of many who would gladly mount their specimens in this way, but for the apparent difficulty of doing so permanently. "Oh, my fluid mounts all leak and are ruined in a few months," or, "I cannot make a fluid mount without air bubbles, and so don't bother with them," are remarks I have heard over and over again, and can appreciate the truthfulness of same, for did I not wallow through the same slough for years? The books, for instance, gave me no real aid. They were misleading and unsatisfactory. Quekett (my first, and therefore best remembered authority, whose well thumbed work lies before me), says: "The *best* method for mounting in fluids is as follows: Take a slip of thin plate glass, lay it flat and place a drop of the preservative fluid to be used upon it in the centre; in this the object is laid, and after having been properly spread out with the needle point, it is ready to receive its cover of thin glass. The edges of the cover should be touched slightly with the cement to be used and then laid upon the object, which is effected by dropping the cover gently upon the fluid and pressing it lightly, to exclude the excess and to leave only a thin stratum intervening between the two glasses; the excess may be removed by small slips of blotting paper. After this operation is finished a thin layer of cement is to be placed where the edges of the cover come in contact with the bottom glass; when this is dry another thin layer may be put on, until the angle between the two glasses is nearly filled up. Care must be taken to exclude all air bubbles from between the cover and bottom glass, otherwise the cement will run in, especially when the bubbles are near the edge." He then naively adds: "*Objects mounted in this way seldom keep* very long," to the truthfulness of which many a poor fellow as well as myself can testify.

Let us then commence with the axiom that all fluid mounts *must* be made in a cell, properly constructed of materials which will resist the action of the fluid, and of sufficient depth to entirely submerge the specimen, so that the latter shall exert no upward or lifting action upon the cover. The latter is of special importance, since if the slightest pressure be necessary to force down the cover upon the walls of the cell, the continued pressure of the confined specimen will in a short time raise it and cause a leak.

The best material for making cells for fluid mounts, where those deeper than can be made with cement alone are required, is undoubtedly glass, attached to the slide by marine glue. They are absolutely permanent and leave nothing to be desired save that they were less costly. But they are necessarily so, and for this reason are comparatively little used. Block tin is also an excellent material, and cheaper than glass, but it is heavy and not so readily or securely cemented to the slip as the latter. I have not had sufficient experience in its use to give any opinion as to its resisting the action of all the mounting fluids usually employed, but feel sure it is quite safe against glycerine or camphorated water.

In my own practice, where a cell deeper than can be conveniently made with cement alone is required, I have for several years used wax exclusively, and have had no reason to change the favorable opinion of its merits expressed in the paper I had the honor to read before the American Microscopical Association at its Detroit meeting in 1880. At that time I had been using the wax cells for fluid mounts for some time; the three years' additional experience since gained have only served to confirm my conviction that it is a material deserving of the largest use for this purpose, being easily prepared, entirely permanent, and so cheap as to be almost without cost. To sum up then, if the tissue to be mounted be exceedingly thin, requiring scarcely any cell to contain it, make the same with cement alone; if a cell of greater depth be demanded, use glass cemented to the slip with marine glue, if the question of expense be not a serious one with you; if it is, use without hesitation the wax cells (prepared as will hereafter be directed) for any cells not more than ⅞ inch diameter and ⅛ inch deep, and give yourself no uneasiness as to their permanency.

The *essentials* for making any of these cells are like those for balsam mounts, neither numerous or costly, though, as the making

and finishing of the mount, properly, is of prime importance to its continuance, I shall include some articles among the *essentials* which might be considered *luxuries* in balsam mounting. Perfectly flat slips *must* be procured, and good covering glasses, *flat* also. If glass cells are to be used, I should advise purchasing them ready made, as but few have patience sufficient to prepare them properly for themselves. They are not so very costly if purchased unattached to the slips, and the method of so doing with marine glue will be given presently. The same may be said of block tin cells, which cost about one half as much as those of glass. To resume, wax in sheets, with a proper punch, as described in my paper on balsam mounting; a turn-table—self-centering, by all means; white zinc cement, *properly made*; a few needles in handles, a pair of curved forceps, some delicate spring clips, or a Smith's mounting instrument; a good sized camel's hair brush, some absorbent cotton or blotting paper, and capillary or dropping bottles to contain the preservative fluids will be about all the tools we shall require for our work.

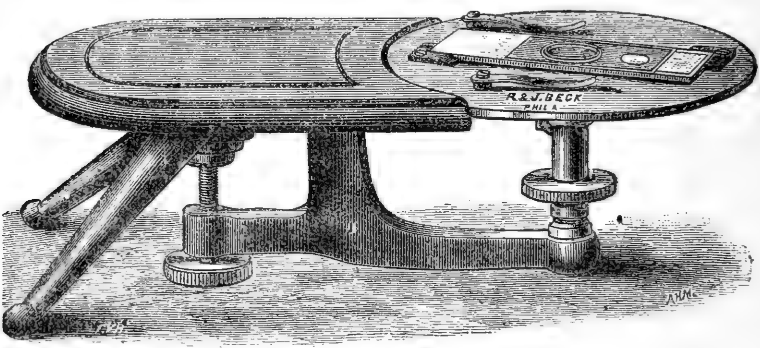

FIG. 17. Self-Centering Turn-Table.

The simplest form of cell is of course one constructed of cement only, and we will make our beginning with this. What have we ready that so shallow a receptacle is suited to? Here is a potato; let us scrape a small portion of its juicy whiteness into this beaker and add a little cold water. The white mass which settles at the bottom of the glass is almost all starch, many of the grains free, others bound together in their parent cells, as our microscope will presently show. After repeated washings, in cold water, and

allowing the starch to settle after each, pour off all the water, and in its place add equal parts of glycerine and distilled water, with a little, *very little*, of aniline blue. Now we have an object ready for mounting, which will amply repay any labor or patience we may bestow upon that operation.

A good sized cell for this specimen is one that can be covered with a ⅝ in. circle. We therefore place a cleansed slip of glass in the jaws of the self-centering turn-table, and with the zinc cement run a ring upon its surface about ⅛ of an inch wide and a little over ⅝ in. outside diameter. The circles traced about the centre of the table, which are visible through the glass placed upon it, are ready guides in doing this. Two or three layers of the cement are to be placed one over the other, and the slip must then be laid aside to harden, for at least forty-eight hours before using. I find I have gotten the cart before the horse in preparing my specimen before the cells were ready, but fortunately the former will keep, and my kind reader will pardon the oversight, and will *suppose* we commenced the other way.

The cement being thoroughly dry and hard, the slip is to be again placed on the turn-table and a fresh coat applied, taking care not to let it extend quite to the *inner* edge of the cell. Then from one of our capillary bottles, containing equal parts of glycerine and distilled water, sufficient must be expelled to fill the cell full to its *inner* edges, and rise up in the form of a convex lens above its centre. The application of the warm hand to one of these bottles is sufficient to drive out any amount of its contents that may be desired; but the most useful appliance for the purpose is a small vial with a hollow glass stopper, terminating in a minute tube at its bottom, and a round ball or bulb at its top, in the centre of which is a small opening. When the vial is filled with any fluid, and the stopper replaced, the fluid rises within it to the same level as that in the vial. When the stopper is removed, with the forefinger placed upon the opening, it of course carries its contents with it, and any desired portion of these may be carefully deposited within the confines of our cell by raising the finger cautiously and allowing the air to enter the bulb. A half dozen of these dropping bottles, placed in as

FIG. 18.
Capillary Bottle.

many openings in a solid block of wood, and covered with a bell glass to exclude dust, forms the handy little appliance known as Ranvier's Necessaire, which I would advise every working microscopist to provide himself with.

It is to be hoped our cell with its fluid contents has been under the friendly protection of a bell glass or inverted tumbler during this digression, otherwise some of the dust always floating about, and which is one of the microscopists most insidious foes, must have found its way unbidden into the same. With a small camel's hair brush or red Sable pencil, take up a portion of the starch which has

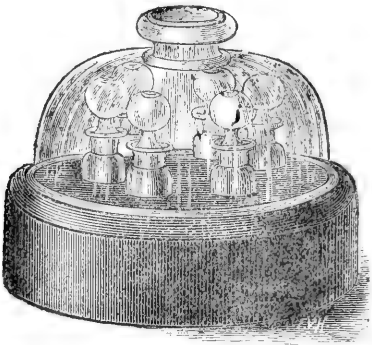

FIG. 19. Ranvier's Necessaire.

settled at the bottom of the glass and place it on the fluid in the cell; it will instantly sink to the bottom, and must be evenly distributed over the same, with a small brush or needle point. A cleansed circle of thin glass is now to be taken up by the forceps, gently breathed upon, and one edge lowered upon the still soft cement of the cell. When it is found to be firmly anchored as it were, lower the other side gradually, so as to gently drive out the excess of fluid without dislodging the starch granules, until the whole cover lies flat upon the cell. Then gently with the points of the forceps press it down upon the cement all around the circumference of the cell, taking great care not to touch the glass where it is unsupported by the cell wall, since, being elastic, it will yield to the pressure, and a portion of the fluid will be expelled, only to be replaced by *air* on removal of the pressure, thus compelling us

to do all our work over again. When the cover appears to be fixed with some firmness, we apply a delicate clip made of spring brass wire, after this form, which exerts just sufficient pressure upon the cover to hold it in place during the necessary washing which must follow ere a further application of cement can be made. These clips can be obtained of the opticians very neatly made and nickel plated for a trifling cost. By some, an applicance known as Smith's Mounting Instru-

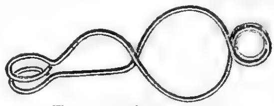
FIG 20. Spring Clip.

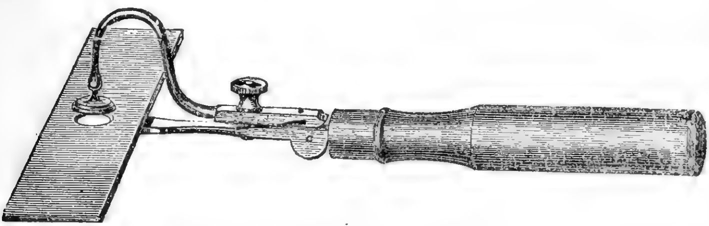
FIG. 21. Smith's Mounting Instrument.

ment is used, but unless very carefully handled is apt to exert too great a pressure upon the thin cover and thus force out the contents of the cell.

It being absolutely necessary to remove all the superfluous glycerine which has run out upon the slide before beginning to seal up the cell, we must now proceed to wash it off, under a running tap if one is handy, if not, in a basin of water; using the large camel's hair brush and soap freely; finishing with a rinse of pure clean water, and drying thoroughly with a clean soft towel. Then place the slide again on the turn table, and run on a layer of cement; to be followed (when dry) by others, until the desired finish is obtained, either with or without colored rings, as the fancy of the worker may dictate. My own practice for some fifteen years has been to use only the white zinc as a cement; to finish the mounting complete with it, and then to finish off with a delicate line of French blue, in the middle of the spotless white of the cell or ring.

Having mastered the simple cell of cement as above, we next come to those of greater depth, for containing specimens too thick for the former. The simplest and at the same time the most satisfactory of any with which I have worked are made of white sheet wax, in precisely the same manner as those described in the

second paper of this series, excepting the use of the white zinc cement, in place of balsam. The ground work or foundation ring of cement is to be made upon the glass slip with this material, and allowed to harden thoroughly; then another layer is added and the circle of wax laid upon it, pressed down and covered with at least two coats of zinc, inside and outside. If not deep enough, a second or even a third ring of the wax may be added, care being taken to cover each completely with the cement. When thoroughly dry and hard, the cell is to have a fresh coat of cement run upon its top surface, be filled with the preservative fluid, and the object (previously soaked in the same) is to be placed within it, any floating or hidden air bubbles removed with the needle, and the cover placed on, excess of fluid expelled, washed, cemented, etc., etc., precisely the same as we did in the case of the shallow cell.

THE PODURA SCALE.

BY A. Y. MOORE, M. D.

IN the December issue of the *American Monthly Microscopical Journal* appears an article by the editor, Prof. R. Hitchcock, upon the scales of that ametabolian articulate commonly known as podura.

In the article referred to, we are told that, although not difficult of resolution, the scales are valuable for testing objectives of all powers; that eminent authorities have differed in their interpretations of the appearance of the scales; that some objectives give appearances differing entirely from others; and further, that it is not now a question of structure but of appearance.

Now, it may be that I misunderstand the import of this; but, if not, it is a peculiar statement.

If it be no longer a question of structure, why should it be a question of appearance? If the structure be known, the appearance must accord with that structure, modified by the difference in the color correction of different objectives.

We are told that some objectives show the exclamation points or spines with a longitudinal slit of light, tapering at both ends; while other objectives show the line of light with a distinct head from which the line tapers.

Now, I fear that the gentlemen by whom the examinations were made, did not give sufficient attention to the spherical correction; for, with the spherical aberration properly corrected and the light

central, but one appearance is seen, providing the focus is exactly adjusted and color corrections of the objectives be the same.

It is well known that perfect color correction cannot be made with the glass now used by opticians and that even the best objectives show considerable residual color. The exact tint of color depends upon the glass used in the construction of the objective and the exactness of the correction for primary chromatic aberration.

In most of our best objectives (being slightly under-corrected) the residual colors are green and ruby red, and with proper spherical correction the spines of the podura scale show of a ruby red with green interspacing. Any change of residual color changes the apparent color of the spines, but the form should remain constant with proper spherical correction.

Now, what is the shape of these spines? The books throw but little light upon the subject. However, the old idea of rows of dots, triangles, etc., has given way to the spine theory. But what is the shape of the spines? In his work "How to See with the Microscope" Prof. J. E. Smith says the small ends of them are to be sharply defined; and in the illustration which he gives, the small ends are represented as sharp points! I have never yet seen an objective, which, when properly corrected, would show the small ends as sharp points. Prof. Smith kindly loaned me his Tolles' $\frac{1}{6}$ and $\frac{1}{10}$, both immersion lenses, and neither of them can be forced to show the spines as represented in his work.

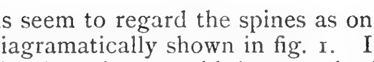

FIG. 1.

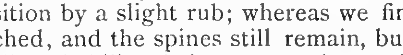

FIG. 2.

Some persons seem to regard the spines as only attached at the small end, as is diagramatically shown in fig. 1. If this were so, it is highly probable that they would become broken or bent from their normal position by a slight rub; whereas we find scales which have been scratched, and the spines still remain, but in an injured condition. In all probability their true attachment is by nearly the whole of their under surface as is diagramatically shown in fig. 2.

In fig. 3 I have endeavored to show, by a camera lucida drawing, the appearance under a strictly first-class objective in correct adjustment. Here the spines are shown magnified seven thousand six hundred diameters, by a Spencer immersion $\frac{1}{6}$—a lens of rare excellence and one which resolves No. 17 of Möller's balsamed plate by central lamplight.

The podura scale from which this figure was drawn is one from the original Beck stock. I have been asked why the "Beck

poduras" are any better than others. It is simply because they are larger and more strongly marked. They are, or rather, were, obtained from the species known as *Lepidocyrtus curvicollis*. These Mr. Richard Beck obtained from a stone-heap in his brother's yard.

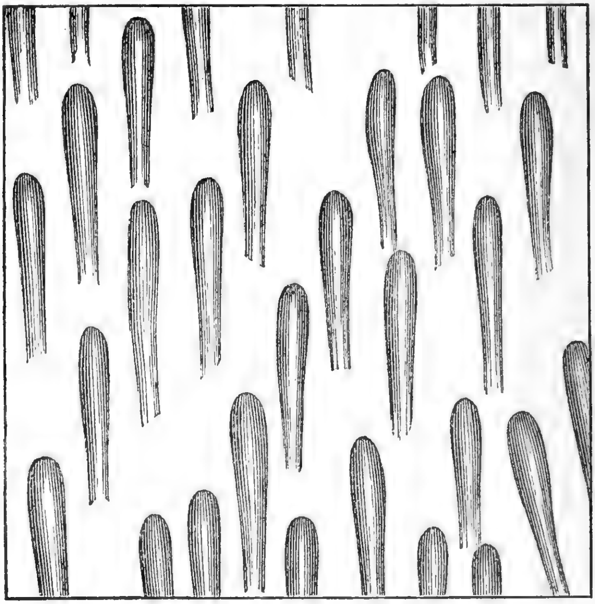

FIG. 3. SPINES OF PODURA SCALES, X 7600 BY SPENCER'S 1-6 B. A. 130° AND 1-10 IN. OCULAR; CENTRAL LIGHT.

At one time Mr. Joseph Beck had the stones removed, and since then the poduras have not been seen. Mr. Richard Beck had material enough on hand, however, for quite a number of mounts, so that slides of these exceptionally good scales can still be obtained.

MICROSCOPICAL EXAMINATION OF POWDERED VEGETABLE DRUGS AS OBTAINED FROM WHOLESALE DRUGGISTS.

BY C. L. BECKER, PH. C., LINCOLN, ILLS.

HAVING had my attention called to the adulteration of powdered golden seal, through the September number of the Chicago *Druggist*, by Mr. C. B. Allaire, and also to the large list of adulterated powdered drugs reported by Mr. E. B. Stuart, in the same number of the above journal, I made a microscopical examination of

all or nearly all the powdered vegetable drugs of a retail drug store. The drugs examined were as obtained from the different wholesale druggists when bought in bulk. Some of the powders also had been in stock for a number of years, having been bought before the various states enacted laws against the adulteration of drugs. The following shows the result of the examination :

Drugs.	Pure.	Adulterated.
Powdered Acacia	Pure.	
" Aconite root	Pure.	
" Asafœtida		Adulterated.
" Bayberry bark	Pure.	
" Blood root	Pure.	
" Buchu leaves	Pure.	
" Berberis vulgaris	Pure.	
" Canella bark	Pure.	
" Colombo	Pure.	
" Capsicum	Pure.	
" Cubebs	Pure.	
" Cherry bark (wild)	Pure.	
" Cimicifuga	Pure.	
" Cloves		Nature undetermined.
" Cinnamon		Starch and undetermined matter.
" Digitalis	Pure.	
" Euphorbium	Pure.	
" Elm bark		Wheat flour, large per cent.
" Fenugreek seed		Corn meal, large per cent.
" Guarana	Pure.	
" Gentian	Pure.	
" Gamboge		Inferior gum, containing crystals of silica.
" Ginger root	Pure.	
" Golden Seal	Pure.	
" Indian turnip	Pure.	
" Ipecac	Pure.	
" Jalap		Undetermined vegetable matter.
" Lobelia	Pure.	
" Liquorice root	Pure.	
" Mustard seed		Wheat flour, turmeric.
" Myrrh	Pure.	
" Mandrake		Wheat flour.
" Nux Vomica	Pure.	
" Nut Galls	Pure.	
" Poke root	Pure.	
" Poplar bark		Large per cent. wheat flour.
" Rhubarb		Adulterated.
" Senna	Pure.	
" Sarsaparilla	Pure.	
" Serpentaria	Pure.	
" Skunk cabbage	Pure.	
" Valerian root		Wheat flour.

Out of these forty-two powders examined, twelve powders, or 28 per cent., were found adulterated.

In each case the samples examined were carefully compared with powders of known purity, obtained by powdering the crude drugs; some of which were kindly furnished by Mr. C. B. Allaire, of the firm of Allaire, Woodward & Co., Peoria, Ill., to whom the writer desires to express his thanks.

A COUNTRY DOCTOR AND HIS MICROSCOPE—SOME OF HIS EARLY CASES.

BY W. W. MUNSON, M. D., OTISCO, N. Y.

I.

IN the autumn of 1879, my friend, Dr. C. Green, of Homer, N. Y., sent me a few drops of fluid in a tiny vial, pleasantly stumping me to tell where it came from. My remembrance is that he gave me no clue, whatever, to its origin.

The use of the microscope was quite new to me at that time; but I returned a positive verdict that the specimen was from an ovarian cyst, all because of the "ovarian granular cell," the "ovarian corpuscle," "Drysdale's cell," that I had read of, but had never before seen, that cell upon which so much discredit has been thrown.

Dr. Green then wrote me that the fluid was drawn, as a test specimen, from the abdomen of a patient whom he had examined, in consultation with her attending physician, and that he had settled upon ovarian tumor as the diagnosis, before sending it to me.

During the next summer, an acquaintance from Homer, with an abdominal enlargement, was visiting friends in our town, and I was asked to examine her. I did so, and gave it up! The next day it incidently came out that she was the patient from whose abdomen the fluid above mentioned was taken. I at once concluded that her tumor was ovarian, and sent her word to that effect.

Early in 1881 this lady went to Buffalo to consult the late Dr. J. P. White, who wrote me, in answer to my inquiries: "In the case of your friend, Mrs. H., I performed my 120th ovariotomy," etc., etc.,—giving result of operation, weight and nature of tumor, etc.,—thus finally confirming my diagnosis made by the use of the microscope alone.

Mind, Mr. Editor, I don't tell this story for the purpose of giving so much information to microscopists, nor to boast of the least bit of skill on my part; for I was far from skillful, having had my instrument but a few months; but to show those physicians who make no use of the microscope, that they are missing a valuable aid in making up their cases.

[Translated from the "Journal de Micrographie," September No. for 1882.]

PREPARATION OF DIATOMS.

BY J. BRUN, PROFESSOR AT THE UNIVERSITY OF GENEVA.

Translated by P. R. B. de Pont, Instructor in French, University of Michigan.

HERE is a new process I have devised to destroy the endochrom of diatoms and thus permit to make preparations of them. It is so convenient and gives such good results that I consider it a duty to indicate it in a few lines.

If we have a fresh magma of diatoms still moist, we must add a few crystals of *permanganate of potassium* and very little water—about one part of the salt to ten of water. If the diatoms are dried up, pure or mixed with earth or organic matter, we must moisten them with a concentrated solution of the same salt containing a few crystals in excess.

The reaction of the permanganate must last about 12 hours. It is well to stir now and then the mixture placed in a vial of an average capacity of 100 gram., and to place it in a water bath or expose it to the sun.

Next the vial must be half filled with water and a small quantity of *calcined magnesia*, about 0.50 centigr., added to it, which must be left to act for two or three hours, giving it an occasional shaking. Then we pour in a small quantity of not more than one gramme and every ten minutes some pure *chloric* acid.

When the whole contents of this vial have lost every trace of color, the operation is ended. If need be, the reaction may be facilitated by plunging the vial in water very hot or even boiling.

Then we proceed with the usual washings and decantations, and here let us remember that the absolute purity of the *distilled* water, for the latter washings, stands always as an essential condition of success.

In this process we have first the powerful *oxydation* of the endochrom by the permanganate and the magnesia; then by means of the acid, we obtain a liberation of gaseous *oxygen* which acts as *oxydizing agent*, and then of chlorine which acts as *decolorant*. It is doubtless to these multiple and successive reactions on the outside and even inside of the valves, that this most perfect cleaning of their silicle must be attributed. By this treatment the delicate species are not corroded, especially if, before the *acid action*, enough water is added. The surface of the valves has lost all its coleoderm; it appears in all its brightness and the minutest details, striæ and dottings are clearly brought out.

I have tried successively, for the last years, all the various physical or chemical processes that have been announced, and I can say that I have found none which would succeed as completely and regularly as the above.

Society Proceedings.

BUFFALO MICROSCOPICAL CLUB.

Meeting of October 10th, 1882.

A regular meeting of the Buffalo Microscopic Club was held at its rooms in the library of the Society of Natural Sciences on the evening of October 10th.

The paper for the evening was read by Prof. D. S. Kellicott, upon "Forms of Life Observed in Well Water." The well in which the organisms were found is 30 years old, and about 35 feet deep. Temperature of water in March 46° F., and in September 56° F. The water drawn by an old fashioned wooden-pump is clean, colorless and tasteless, and has never been the source of disease so far as known.

Analysis, (Warklyn): Total solids 21 grains per gall; chlorine 35 grains per gallon; free ammonia none; albuminoid ammonia .008 parts per million.

Organisms found: Bacteria, none until the water had stood for some time in a warm room.

The same forms were found in the well four years ago, showing that the inhabitants are constant. They are :

1. *Tardigradus macribiotus Hufelandii;* numerous.

2. An *anguillula;* abundant.

3. *Rotifer Vulgaris*, and *R. Colurns*, *both of which were without eye spots*, indicating a remarkable change in these organisms, brought about by their continued existence in the dark.

4. *Amœba Radiosa*, and another form which has not been identified.

5. *Englypa Difflugia*—shells only.

6. *Actinophry. Sol.*

7. *A Vaginicola*—a most beautiful species, not figured in Kent, and believed to be new.

8. *A Vorticella* with unusually long pedicle.

Of infusoria, there were found:

9. *Colops.*

10. *Cylindricum.*

11. *Paramecium.*

12. *Monas-lens.*

Of plants there were:

13. *Pleurococcus.*

14. *Ankistro-desmus.*

15. Fungus spores of various kinds.

The paper was discussed by the members, but nothing specially new was brought out.

Under the head of "Personal Work," Mr. Henry Mills reported observations upon a new sponge sent him by Mr. Francis Wolle, of Bethlehem, Penn., and which Mr. Mills has named *Meyenia Everettii*, it having first been found on Mount Everett, in Mass. It is partially described as follows:

Found growing attached to weeds and sticks, and on the ground, in shallow water; texture loose, and branching; skeleton spicula, slightly curved, slender, free from spines, sharp pointed, and in length about 0.01 inch. Statoblasts globular, and about 0.03 inches in diameter.

Birotulates slender, closely packed radially in outer wall of statoblasts; length varying from 0.002 to 0.003. Head of birotulate stellate, shaft smallest in the middle, not spined. The dermal covering of this sponge contains very minute birotulates, thickly and evenly distributed throughout.

Dr. W. C. Barrett reported a visit to the Peabody Museum of Archæology, in Cambridge, Mass., and observations upon organic remains found there, which had been taken from Peruvian mummy tombs.

Also a visit to the laboratory of Carl Heitzman, in New York, and the result of some observations there made upon blood corpuscles. He was fully assured that, he said, the appearances which are claimed by Heitzman, Elsberg, and others, as demonstrating the reticulated structures of protoplasm, and that it was not the result of want of focusing, but as he did not assist in the preparation of the corpuscles, he was unable to say whether they were produced by the process employed or not. Upon that point he desired to withhold his opinion until after making careful preparations and observations for himself.

Prof. D. S. Kellicott said that his pupil, Mr. H. S. Champlin, had found *Pectinella magnifica* living in great numbers upon *Valisneria spiralis.* Authors say this species is found only on old ecaying wood. Last year it was found abundant on the stones of

Bird Island pier, in Buffalo harbor. Now it has appeared on water plants.

Ophrydium versatile, reported at last meeting, has since been found in large masses along the banks of the river.

On Saturday last the green covering from the dripping rocks of the old mill at the foot of Amherst street, upon the river, was scraped away, and found to be composed almost entirely of *scenedesimus acutus*. The species of this genus are said by authors to occur in water from bogs and ditches, usually. He also found in the same gathering the varieties of this species, namely, *S. obliquus* and *S. dimorphus*.

It is worthy of note that *Ophanochate repens* occurs abundantly on an *Œdigonium* which grows in a sulphur spring near Buffalo Park.

After the reporting of some other observations, of local rather than general interest, the club adjourned.

The November meeting of the Buffalo Microscopical Club was held on the evening of the 14th. The order of business as announced was a general exhibition of objects.

The secretary, after reading the minutes of the last meeting, called the attention of the members of the club to the importance of subscribing to the journals devoted to microscopy, and mentioned THE MICROSCOPE, edited by Prof. C. H. Stowell, of Michigan University, as the one in which the reports of the society would be published and urged the members to subscribe for it. The secretary also announced that the topic for consideration at the next meeting of the club would be "Bacillus and its relations to tuberculosis," by Mrs. Dr. Moody.

Prof. Kellicott gave a resumé of the current microscopical literature, bringing up the late paper by Prof. Haeckel on the "*Protista*." The views of Prof. Haeckel, he stated, were not generally upheld by the highest authorities on the subject of minute life. Dr. W. B. Carpenter's statements regarding the standing of American microscopists, viz.: "That they were now going over ground which English microscopists had gone over forty years ago," were brought up. These statements of Dr. Carpenter are unquestionably untruthful so far as his remarks relate to American objectives, as in this respect the Americans have been leading their

English cousins since Spencer and Tolles took hold of the improvement in lenses.

As discussion on these subjects would have taken the full evening, Dr. Howe moved that the rest of the evening be given to the exhibition of objects, which was carried.

Many interesting things were shown. Mr. Ward exhibited the sweat tubes in the human epidermis, epithelia in the tongue of a cat, papillæ in a human finger, head of a tapeworm, several interesting insects, the ovipositor of the saw fly, etc.

Dr. H. D. Walker, of Franklinville, N. Y., drew attention to a peculiar pulsating organ in the leg of an aphis or plant-louse.

Henry Mills showed how valuable even the dust from the Philadelphia mint was, as under the microscope it was found to consist of very small particles of fine globules of gold. He also exhibited the statoblasts of fresh-water sponge.

Prof. Kellicott showed statoblasts of a new form of *plumatella*, which he had first found in Michigan.

Dr. W. C. Barrett showed sections of human dentine, the tubuli of which were penetrated, distended, and in many places broken down by bacteria. Also slides in which round dentine had been bored through in various directions by fungi.

Dr. Geo. R. Stearnes had under his stand diseased hair bulbs, surrounded with the trycophiton parasite of ring-worm.

Miss Mary F. Hall exhibited specimens of her own preparations, viz.: Sea weeds with diatoms growing on them, fresh-water sponge, butterfly scales, etc.

Dr. Geo. E. Fell exhibited the wonderful sucker of the Dytiscus or large water-beetle which is attached to the fore legs and enables the beetle to attach himself to smooth surfaces; also sectional views of the stomach of a frog and a human kidney. Many other interesting objects were shown by the members before adjournment.

Meeting of December, 1882.

At the regular monthly meeting of the Buffalo Microscopical Club for the month of December, the paper of the evening was read by Mrs. Mary B. Moody, M. D., upon the Bacillus of Tuberculosis. The experiments and observations of Koch were detailed, his methods given and his results summarized. Later discoveries were

also collected and a very complete resume of the whole subject was presented.

Mr. Mills thought that the experiments with rabbits, upon which Dr. Koch placed so much stress, were scarcely conclusive, inasmuch as they are extremely liable to lung diseases.

Dr. Hubbell agreed with Mr. Mills and said it was well known that both rabbits and guinea pigs are very susceptible to all scrofulous disorders. He believed that healthy people were frequently inoculated by inhalations of infectious matter from tuberculous invalids.

Mr. Pohlman had experimented with rabbits and had examined their lungs and had never found them affected with tuberculosis.

Dr. Alling had verified every one of Dr. Koch's conclusions, having followed his experiments, and had made repeated observations upon the bacilli of tuberculosis.

Dr. Fell had examined the sputa of people afflicted with pulmonary diseases, but had failed to recognize the bacillus, though in the light of subsequent reflection he has little doubt of its presence.

Dr. Barrett said it was yet a disputed question whether organisms found in diseased tissues were the cause or effect of the malady. It was persistently urged by good authorities that they were mere scavengers accompanying and finding their proper pabulum and habitat in the products of abnormal function.

Prof. Kellicott said the same objections were urged against the modern theory of fermentation, but they had been disproved and he doubted not they would be in this case.

The customary resumé of current literature was presented by Prof. Kellicott.

Reports of personal work were made by a number of members, but no abstract, as required by the society rules, was presented to the secretary.

CHICAGO MICROSCOPICAL SOCIETY.

Meeting of November 10th, 1882.

Dr. Wm. T. Belfield gave the history of several cases of parasitic diseases and showed and described their respective parasites, among which were filaria sanguinis hominis, actinomyces bovis, and bacilli of leprosy, splenic fever and tubèrculosis and micrococci in ulcerative endocarditis.

He also exhibited Abbe's new illuminating apparatus.

There being no further business the meeting was declared informal.

Meeting of December 8th, 1882.

Dr. R. Tilley gave an account of the theory of the development and life history of the blood corpuscle as advanced by Dr. Richard Norris, of Birmingham, England.

The chief points were as follows: There exists in the blood an absolutely colorless corpuscle, and others of gradually increased shades until we reach the extreme red color.

The colorless disc is the young corpuscle just thrown into the blood channels from the lymphoid organs.

The extreme red corpuscle is the corpuscle approaching its dissolution.

The colorless disc is invisible because it is of the same specific gravity and index of refraction as the plasma.

These discs can be rendered visible by various reagents and mechanical devices.

The formation of the fibrin of the blood is due to the coalescence of these colorless discs.

A discussion followed the reading of the paper entered into by Dr. Curtis, Mr. Fellows and others.

Dr. Tilley succeeded in giving a fine demonstration of the presence of the colorless corpuscles in the blood, after which the meeting adjourned.

Selecting and Arranging Diatoms.—Mr. J. Chalon lately described his method of selecting and mounting diatoms, before the Belgium Microscopical Society. He picks them up with a hog's bristle, 4–5 mm. in length, dipped in glycerin, which causes the frustules to adhere to the bristle. The cover-glass upon which the diatoms are to be arranged is coated with a thin layer of glycerin, by placing a drop of glycerin in 25 parts of alcohol upon it. The alcohol evaporates and leaves the glycerin. This retains the diatom in place, and when all are arranged, the cover-glass is heated to drive off the glycerin, when the diatoms remain firmly attached to the glass.—*Ex.*

Correspondence.

To the Editor of The Microscope:

DEAR SIR—In the number of THE MICROSCOPE you were so good as to send me, I see an extract from the *Scientific American*, "Tracings for the Lantern." Having adopted a similar method for the purpose of demonstrating my own slides, I will just quote you the plan as described by the Rev. Dr. Dallinger, who claims to be the originator of the system. I have seen some of his own slides, lent to me by himself, which are certainly beautifully done, and show all the details in perfection. He directs that "you should use finely ground glass and draw with a very hard pencil. * * * * * Then shade as an ordinary drawing for a tint; wash it after the drawing is complete, and when the wash is dry, breathe upon it to moisten it, and with a camel's hair brush, cut shorter by about half than they usually are made in the hair, dab the wash even. The drawing is now complete, but wants transparency; give this by pouring over (as the photographers do collodion) very much thinned Canada balsam, prepared by dissolving it in benzine until it is of the consistency of thin cream; pour off the superfluous balsam, reverse the slide, lay flat to dry, and cover with a plain glass." You may draw direct from the camera by putting white paper under the object. I have succeeded well with this plan. The glass is supplied by Forrest & Sons, Lime street, Liverpool. The manipulator should be careful to get an even film of balsam when laying flat.

Yours faithfully,

THOMAS RUTRIDGE,

London, England.

SPHERO-CRYSTALS.—G. Kraus records the discovery of sphero-crystals in *Ptelea*, *Conium* and *Æthusa*. In ptelea they occur in the leaf only; in conium they are also found in the stem, flower-stalks, fruit, etc., but in all cases they are found in the epidermis only. They generally have the form of hemispheres, and are attached to the wall; they are radiate or even spined. They are insoluble in either cold or boiling water and in dilute mineral or organic acids. —*Roy. Mic. Jour.*

Editorial Department.

THIS number of THE MICROSCOPE has been delayed a little, owing to the severe illness of Dr. Stowell, the senior editor. On the 10th of December he had given his lectures in the University, as usual, and upon reaching his home, was attacked by a violent chill that continued for three hours. His illness soon took on the form of inflammation of the brain. Although he has been very low, genuine hopes are now entertained as to his recovery. Dr. Palmer, Dean of the Medical Faculty in the University, has been in charge of the case, but has been kindly and ably assisted by Drs. Dunster, McLean, Herdman, Hendricks and others, while some professionals, in nursing, and students from the classes in the Medical Department, have rendered the care all that could be desired. The kindly interest of the community, as represented by from 40 to 60 daily callers at the door, has truly been appreciated by his family. And the kind letters of sympathy received from many states, although no time may have been secured to answer them, have been truly welcome. We trust, however, that Dr. Stowell will be ready to do his usual work on the next issue of THE MICROSCOPE. No doubt the occasion for his illness is traceable to his over-work in some original microscopical investigations. In a near issue of THE MICROSCOPE, the readers may be treated to statements of some of these researches, that possibly are new revelations.

AS THIS is the last number of the present volume, let us call the attention of our subscribers to the importance of renewing their subscriptions at once. It will not only be a favor to those who renew, but also to ourselves, as we wish to get our mailing-books into perfect form before sending the next issue. We have sought to make THE MICROSCOPE practical and available, and we are sure that our increased experience, with a better knowledge of the wants of our readers, will enable us to supply our subscribers with better copies than in the year past. The list of our readers has been largely in advance of what we expected at the beginning. Being entirely secure financially; with a list of advertisers of which any journal may be proud; with contributors whose names secure

them a willing hearing wherever they go; with practical suggestions that touch live questions, in the lines of thought we assume to aid; we are sure that THE MICROSCOPE will be a welcome visitor and earnestly solicit subscriptions for the coming year.

WE have been a little surprised every now and then, to receive orders for our journal from physicians who do not manipulate the microscope, nor make it largely available in their practice. But they claim they receive many practical and valuable suggestions, a single one, being far in advance of the subscription for THE MICROSCOPE for a year.

SEND on a dollar for Volume III. of THE MICROSCOPE.

ON account of the severe illness of Dr. Stowell the work of issuing this number of THE MICROSCOPE devolves on the junior editor, whose editorial ability has never before been tested.

RENEW for THE MICROSCOPE.

WE are glad to have Professor Winchell's name appear among our contributors and hope all who are so fortunate as to obtain this number of THE MICROSCOPE will read his valuable article.

PLEASE notice the extra thickness of this number of THE MICROSCOPE. Past experience teaches that thirty-two pages are not enough for all of the original articles, together with the other valuable matter of each number. In the future, therefore, 48 pages of solid reading matter will be given in each issue. You will then have 288 pages in volume III. Renew at once.

Selections.

[Prepared by Geo. A. Hendricks, M. D., Assistant Demonstrator of Anatomy, University of Michigan.]

New Methods for the Detection of the Tubercle Bacillus.—Ehrlich's method as demonstrated by G. A. Heron, M. D., before the annual meeting of the British Medical Association, may briefly be described in the following manner: Sputum is spread in thin layers upon cover glasses, and allowed to dry; then exposed for about twenty minutes to a temperature of 212° Fahr., or passed quickly three or four times through the flame of a gas jet or of a spirit lamp. They are now ready to be stained with any one of the aniline series of dyes. Fuschine and gentian violet are two of those which Ehrlich has used. In this process these colors are handled in precisely similar ways. A description of one will suffice. Make a saturate alcoholic solution of fuschine, also prepare a saturated watery solution of aniline prepared as follows: Five cubic centimetres of aniline are added to one hundred cubic centimetres of distilled water. Shake frequently for twenty minutes, then pass through a moistened filter. The filtrate contains from three to four per cent. of aniline, and should be as clear as good drinking water. To thirty cubic centimetres of the filtrate are added thirty drops of the alcoholic solution of fuschine. If a glistening metallic film does not appear upon the surface of the mixture, continue to add more of the fuschine solution until the film is clearly marked.

The cover glasses prepared in the way already described are allowed to float for thirty minutes, sputum downwards, upon the surface of a sufficient quantity of the straining fluid, poured into a suitable vessel. When removed the sputum will be strained to a deep red color. The greater part of this deep red color must be removed by washing the cover glasses in a mixture of one part of the acidum nitricum (not dilutum), of the British Pharmacopœia, and two parts of distilled water. Here the beginner may have some difficulty, for he is apt to leave too much of the red dye upon the sputum. After the washing with nitric acid there should be, at most, a slight white-pink tinge, visible to the naked eye, in the sputum. The acid is washed out by dipping the cover glass in distilled water. If bacilli of tubercle are present in the specimen, they will be seen microscopically, as red rods, here and there, and perhaps in clusters, upon a colorless or whitish-pink ground. When

the bacilli are numerous, they could be seen with so faulty a background of color as this, but when they are few they might easily escape notice. A drop or two of a saturated watery solution of methyline blue let fall upon the sputum after the nitric acid has been washed out will bring them into relief. The blue color is washed off to a certain extent with water, just enough of it being left to give a distinct light blue tint to the sputum. Examine the specimen while still wet, with a power of 500 diam. When gentian violet is used, the background should be given by Bismarck brown.

At the same meeting Heneage Gibbes, M. D., presented the following as an easy and simple method for the demonstration of the bacillus: Make two staining fluids—one magenta, which stains the bacillus; the other chrysoidin, which stains the surrounding substance. The magenta solution is made thus: Magenta crystals, two grammes, are rubbed in a glass mortar to a fine powder, dissolve three cubic centimetres of pure aniline in twenty c. c. of alcohol sp. gr. 830, add this to the powder, stirring until all the color is dissolved; then add twenty c. c. of distilled water slowly, still stirring, and put in a stoppered bottle.

The chrysoidin solution is made by rubbing up the color in a mortar with distilled water until it is saturated and then adding a crystal of thymol dissolved in a little absolute alcohol, to make it keep. Neither of these solutions should be filtered when made. The latter should be kept in the dark. A solution, one part nitric acid with two parts of distilled water is also required.

Prepare cover glasses as described in the former method. Filter a few drops of the magenta solution into a watch-glass and place on it a prepared cover-glass with the sputum downwards, care being taken that no air-bubbles are under the cover-glass; it should remain from fifteen to twenty minutes in the solution. It is then put into the dilute nitric acid until all color has been removed. It is then washed in distilled water until the acid is removed, and placed in a few drops of chrysoilin solution which have been filtered into another watch-glass; a few minutes will suffice to stain it deeply. It must then be again washed in distilled water, and the superfluous water drained off on filter paper; it is then to be placed in absolute alcohol, to remove the remainder of the water, and dried thoroughly in the air. When dry a drop of Canada balsam solution is placed on the cover-glass and it is mounted in the usual manner.

Glass funnels should be used to protect the fingers in filtering the stains. Sections of hardened tissues are treated in the same manner, with the necessary modifications, and the bacillus is shown by this method equally well in specimens hardened in spirits or chromic acid.

In a later number of the *Journal* William Vignal, *College de France*, writes of the Ehrlich method, and says the details are very precise, but the following may be added to them with advantage:

1. It is desirable to keep the staining fluid with the cover-glass, during a quarter of an hour, at a temperature of 140° Fahr. The coloring matter penetrates more thoroughly and the bacilli are more deeply and equally colored.

2. It is not advisable to mount the preparations in water, but in a solution of gum mixed with glycerine, prepared in the following manner: Equal parts of neutral glycerine and filtered solution of gum are mixed together; the gum is of the same thickness as the glycerine, and should be, before mixing, heated in a water-bath with a small quantity of arsenious acid, in order to prevent the development of fungi.

3. Aniline dyes are apt to fade very quickly.

4. The tissues from which the sections are made should be hardened in alcohol only. Chromic and picric acid, also salts of chromic acid, prevent the staining of the bacillus. This method of staining is based on the theory that the tubercle-bacillus is enclosed in a sheath, which, by alkalies, is softened and penetrated (aniline water is a liquid alkali), but is hardened by contact with acids. Nitric acid combines with the coloring matter of aniline to form colorless and soluble salts; this acid is thus effectual in removing the color from the other elements of the tissue not required to be stained.

It happens frequently that physicians desire to ascertain whether tubercles contain the bacillus, but they have not the time for making sections. In such cases the following methods may be adopted: divide the tubercle with a bistoury, then scrape one of the surfaces, spread the scraping on a cover-glass, and treat them in the same way as the sputum. In preparations thus made, there are very few isolated bacilli. They are present in clusters, and examined by a low microscopic power represent red or blue spots, but

when a high power is used, each separate bacillus is distinctly visible.

Mr. Vignal says Dr. Gibbes' modification of Ehrlich's method has the advantage of requiring only one staining fluid, which can be prepared in advance. A preparation of sputum can be thus quickly and easily made when the detection of the tubercle-bacillus is sought in order to determine diagnosis.

When the chemicals used in preparing microscopic specimens are not good, the color fades with equal rapidity, whether Gibbes' modification be adopted or not.

Mr. Vignal says when specimens are mounted in Canada balsam, they are cloudy ; this is especially evident when a high power is used. This inconvenient defect, resulting from light passing through media of different refractive power, is remedied by substituting for Canada balsam the mixture of gum and glycerine which is mentioned above.—*The British Medical Journal.*

ADULTERATION.

One bright and glorious summer's night,
When earth, of moon's bewitching light
    A goodly store did borrow,
Three house-flies on a window pane,
Loud buzzing, planned how they might gain
    A feast upon the morrow.

"Well, I for one," the first fly said,
"Shall slake my thirst and dip my head
    Within the milkman's measure."
"Far better yet," said number two,
"The sugar-bowl I'll wander through
    And feast at my good pleasure."

"All right, my friends," said number three,
"Since now I find we can't agree,
    I'll light upon the table,
And there partake of varied food
(As every well-bred house-fly should),
    As much as I am able.

"To-morrow night I'll here await
Your swift return; then we'll relate
Our day of joy or sorrow."
Their plans complete, their eyes they closed,
And on the window-sill reposed,
Impatient for the morrow.

Alas, poor flies! they hoped in vain;
They parted ne'er to meet again,
Recounting days of pleasure;
Instead of milk to quench its thirst,
Of *chalky mixture* drank the first
From out the milkman's measure.

The sugar-bowl, for number two
Proved, sad to tell, disast'rous too—
Well may poor mortals tremble!
Rich marble-dust and silver-sand,
Sent this poor fly into that land
Where flies alone assemble.

The third, intent on suicide,
A dish of poison near him spied,
And drank the fatal potion.
But stay, your tears ye need not shed!
Adulterated poison—*fed*
And proved a soothing lotion.

—*Our Continent.*

STRUCTURE AND MOVEMENT OF PROTOPLASM.—G. Klebs gives in the *Biol. Centralbl.* a summary of the present state of our knowledge respecting the structure of protoplasm and the movements to which it is subjected and the connection between these two. He sums up by saying that, while we are still ignorant of the chemical composition of protoplasm and of the mechanical forces which lie at the base of its mobility, it becomes more and more evident that the life of all living organisms depends on the vitality of this one and the same substance.—*Roy. Mic. Jour.*

Items.

A new edition of Hogg on the Microscope is just issued.

Gold-chloride is a valuable reagent in the study of cartilage. It dyes the cells violet without causing the protoplasm to shrink.

The "Jumbo" microscope, made in 1851, owned now by Mr. Crisp, of London, weighs 1½ cwt., and the body tube is 4 inches in diameter.

KLEINENBERG'S FLUID.—Used for instantly killing small zoological specimens:

Picric acid (saturated solution in distilled water),	100 volumes.
Sulphuric acid (concentrated) - - -	2 "

TIT, BUT NOT TAT.—If any one is so wicked as to poison his grocer, who brings him food every day, the severest penalty of the law would be enforced, but if your grocer poisons you by adulterating your food, ten chances to one no notice will be taken of it.—*Ex.*

CHLORINATED SODA.—A solution of this is made as follows: To a pint of distilled water add two ounces of fresh chloride of lime, shake thoroughly, then slowly add it to a saturated solution of common washing soda until it becomes thick and turbid; let it stand until thoroughly settled, when the clear liquid should be taken off with a siphon, when it is ready for use. It should be kept tightly corked in a dark place.

VACCINAL MICROCOCCI.--The Lancet says that M. Straus has plainly demonstrated the presence of the special micrococcus in microscopical preparations of the vaccinal pustule from the calf. He places the excised fragments of the skin in absolute alcohol, cuts sections and stains them with methylamine violet, and then discolors them, until only the nuclei, the bacteria and micrococci remain visible. Under a strong magnifying power, the latter were visible, as extremely minute points tinted blue, about a thousandth part of a millimetre in diameter, and grouped in colonies.

TO DESTROY BACILLI.—Prof. Herr R. Koch has been trying to discover what are the best means to destroy the spores of bacilli, how they behave toward the microphytes most easily destroyed, and

if they suffice at least to arrest the development of organisms in liquors favorable to their multiplication. He got nothing worth mentioning from the use of phenol, thymol, and salicylic acid; and, strange to say, sulphurous acid and zinc chloride also failed to destroy all the germs of infection. The best effects were obtained from chlorine, bromine, and mercuric chloride. Solutions of mercuric chloride, nitrate, or sulphate when diluted 1 to 1,000 parts, destroy the fertility of the spores in ten minutes.—*Ex.*

PREPARING TAPEWORMS.—Dr. G. Riehm recommends the following treatment of specimens: To prevent contraction at death, he cleans the living cestode with a brush, and holds it in the hand until it has extended itself under the action of the warmth, and then rolls it upon a glass tube and plunges the whole into spirit; undue adhesion to the glass is remedied by soaking in water. Such specimens are well adapted for mounting under pressure; they may be stained with alum-carmine or with hæmatoxylin; if with the latter, the specimen should be treated with acetic acid for a minute after staining and then washed in ammonia to remove excess of color.

For minute investigation, sections made parallel to the flat surfaces are preferable. To prevent the last sections breaking out of the imbedded mass, this should be made of equal parts of paraffin and white wax with the addition of one or two drops of Canada balsam dissolved in turpentine for each gramme of the mixture. The razor should be wetted with benzine, care being taken not to moisten the object itself too much with the benzine. To secure having the sections cut in the right place, the specimen is soaked in turpentine, placed in a watch-glass of imbedding mass kept liquid by heat, and left there until seen by its transparency to be thoroughly penetrated; some of the mass is then removed with a hot instrument and placed on a slide and pressed out, the specimen is placed on the stage of the microtome and the slide with its paraffin is placed on it; when cool the slide may be removed, leaving the specimen imbedded in a strictly horizontal position. The excretory vessels are injected with Berlin blue by simple insertion of the syringe: if the animal is moving actively the injection runs forward with difficulty and in any case the neck and head require manipulating with the finger or a wet brush, in order to drive the injection through the narrow portions of the vessels which occur at the joints.—*Royal Mic. Journal.*

Reviews.

ANATOMICAL TECHNOLOGY AS APPLIED TO THE DOMESTIC CAT. An Introduction to Human, Veterinary and Comparative Anatomy. By Burt G. Wilder, B. S., M. D., Professor of Physiology, Comparative Anatomy and Zoölogy in Cornell University, etc., and Simon H. Gage, B. S., Assistant Professor of Physiology and Lecturer on Microscopical Technology in Cornell University, etc. Pp. 575. 1882. New York and Chicago: A. S. Barnes & Co.

This work has grown out of our needs as instructors of students preparing for practical work in human, veterinary or comparative anatomy. (Author's preface.) The general plan of the work admirably adapts it to meet the demands of the laboratory, and its method will prove a valuable guide to all advanced students of comparative anatomy. We call especial attention to the explicit directions for dissection and manipulation. The nomenclature is largely new; it is based upon intrinsic relations; it is therefore technical, and commends itself for its precision, clearness and brevity.

Most of the drawings are marked by a rare degree of accuracy; they evince great skill and thorough knowledge on the part of the artists.

The practical value of this work is greatly enhanced by the numerous alphabetical lists, the synonymy, the tabulations and the extensive bibliography.

Aside from the subject-matter one of the most commendable features of this work is the complete system of indexes; few manuals or works of reference are as systematically and conveniently indexed.

No student of comparative anatomy can consider his library complete without this manual.

THE PROCEEDINGS OF THE FIFTH ANNUAL MEETING OF AMERICAN SOCIETY OF MICROSCOPISTS, held in Elmira, N. Y., August, 1882.

This pamphlet is kindly sent us by the secretary, Prof. D. S. Kellicott. The minutes are put into fine, compact, readable shape. Portions of the debates are given, but the papers read are printed in full. It was a rare meeting of microscopists and largely representative in its character. However, we wonder at the blunder of Biglow Bros., the publishers, in placing several weights of paper and as many tints in the body of the minutes.

THE PHARMACEUTICAL ASSOCIATION OF NEW JERSEY.

We have been kindly remembered with the proceedings of the twelfth annual meeting of this association.

LEONARD'S ILLUSTRATED MEDICAL JOURNAL.

The above journal has come to our table enlarged, rearranged and decidedly improved. The accepted energy and ability of its editor, C. Henri Leonard, A. M., M. D., Detroit, Mich., assures all that the journal will be broad, progressive and valuable. We wish it large success.

THE CITY OF MOBILE AND THE CONTIGUOUS COUNTRY ABOUT THE GULF COAST.

Dr. William H. Anderson, M. D., First Vice-President of the American Medical Association, has put out a bright, racy pamphlet, urging the claims of Mobile as a fine resort for invalids and others from northern climates. A carefully arranged meteorological table is also printed with it. It is evident that the doctor thinks Mobile quite the center of the world, and we are not prepared to dispute him.

NERVOUS FORCE; ITS ORIGIN AND PHYSIOLOGY. By W. C. Barrett, M. D., D. D. S., Buffalo, N. Y.

This paper was read before the American Dental Association at Cincinnati, Ohio, in August last, and seemed so broad in its scope that it was asked for publication. It assumed to treat of the relation of force to matter, as considered in connection with nervous energy. That is original and well put.

OBSERVATIONS ON THE FAT CELLS AND CONNECTIVE-TISSUE CORPUSCLES OF Necturus (Menobranchus). By Simon H. Gage, B. S., Assistant Professor of Physiology and Lecturer on Microscopical Technology in Cornell University.

This paper was presented at the meeting of the American Society of Microscopists, at Elmira, N. Y., in August last, and very kindly received. Prof. Gage drives an intelligent and racy pen, which always yields entertainment and instruction.

A PRICE LIST OF MICROSCOPES, OBJECTIVES AND ACCESSORIES, from Bausch & Lomb, Optical Co., Rochester, N. Y., was duly received.

The cuts are so fine and all separate parts are so nicely shown, with prices attached, that one could buy an instrument with safety by simply consulting this book. The firm is reliable and prompt, as the good work done by their instruments well attests.

CENTRAL NEW YORK CONFERENCE MINUTES (Methodist), 1882. Manley S. Hard, A. M., Elmira, N. Y., Secretary.

This represents a body of ministers numbering about 300, located in the central portion of New York state. The lay members number about 30,000. The church property is valued at $1,500,000, and the parsonage property at $250,000. About $15,000 was given this year for missions, and creditable amounts for other benevolences.

Bishop J. T. Peck presided this year, the session being held at Ithaca, N. Y. The minutes were published under the direction of the secretary, and are among the finest published in the Methodist church. Mr. Hard has been connected with that work for many years, and has "proved a master in that department," as Bishop Harris was pleased to assert of him.

THE NATURALIST'S ASSISTANT. By J. S. Kingsley. Published by S. E. Cassino, Boston, Mass. A hand-book for the Collector and Student. With a bibliography of 1500 works, necessary for the Systematic Zoologist.

The publishers have put this work in very fine form; good paper, clear type and modern shape. In directing to authorities, it is most ample and valuable. It is very liberal in its suggestions, as to methods in collecting material for microscopical investigation; rooms and cases and light for collections; modes for using the microscope, and general laboratory work. The work undoubtedly will be popular.

METHODS OF MICROSCOPICAL RESEARCH IN THE ZOOLOGICAL STATION IN NAPLES. By C. O. Whitman.

The American Naturalist has an article from Prof. Whitman, in the September issue, and a continuation of the same in the October number. These are very instructive and detailed. The first article has relation to preservative fluids, the second to staining methods. As some later date extracts from this work will be given in THE MICROSCOPE.

THE MEDICAL AGE: A Semi-Monthly Review of Medicine and Surgery. Published by Geo. S. Davis, Detroit, Mich.

The above journal has been laid on our table. Brisk, pointed, descriptive of diseases and their treatment. It can but be valuable to new practitioners, and give desirable information to older ones. We are very glad to welcome the *Age* to our list of exchanges.

CONTAGIOUS PLEURO-PNEUMONIA. A report has been received of the new features in the cattle disease, made by Chas. P. Lyman, F. R. C. V. S. to Hon. Wm. G. LeDuc, Commissioner of Agriculture. Third Report.

This report is read with extraordinary interest, since it touches such a vital question of the times, for it not only affects cattle raising, but meat eating as well. Prof. Lyman has given careful study to the question, and has shown by finely executed diagrams the various stages of the disease.

THE PHARMACOPŒIA OF THE UNITED STATES OF AMERICA.—SIXTH DECENNIAL Revision. By Authority of the National Convention for Revising the Pharmacopœia, held at Washington, D. C., 1880. Published by Wm. Wood & Co.

If it would be an easy work to review a dictionary, then the labor would be simple, in giving an idea of what is embraced in this volume of 488 pages. Largely a book of formulas that can but be valuable; with historic references as to this subject from 1817 to the present. At some future time an extended review will be given.

MICROSCOPICAL MORPHOLOGY OF THE ANIMAL BODY IN HEALTH AND DISEASE. By C. Heitzmann, M. D., Late Lecturer on Morbid Anatomy at the University in Vienna, Austria. With 380 original engravings. Published by J. H. Vail & Company, 21 Astor Place, New York City.

The publishers have performed a very successful task in the issuing of this work. There are 849 pages. The cuts are well executed. Prof. Heitzmann takes issue with many of the accepted theories of histology. A review of his positions is being prepared by Dr. Stowell.

GRIFFITH CLUB MICROSCOPE.

A description of this fine instrument, with cuts and directions, is before us. Mr. E. H. Griffith, of Fairport, N. Y., is such an enthusiastic advocate of the microscope and such a genius in manipulating it, that the one of his own invention can but be a welcome instrument.

ON SLIGHT AILMENTS, THEIR CAUSES, NATURE AND TREATMENT. By Lionel S. Beale, M. D., F. R. S.

This is in book form; paper covered, 283 pages, and published by P. Blakeston, Son & Co., 1012 Walnut st., Philadelphia, Pa. It is put up in as fine type, paper and style, as any publication that has come to our table in a long time. This is in fact a book of practice, and no physician can afford to be without it for its price, which is but $1.25 in cloth, or in extra thick paper and cloth binding, $1.75.

The Microscope

AND ITS RELATION TO

Medicine and Pharmacy.

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